DOCUMENT RESUME

ED 121 983 CE 006 739

TITLE Career Development Standards for Vocational Automotive Service Instruction.

INSTITUTION Motor Vehicle Manufacturers Association of the U.S., Inc., Detroit, Mich.

PUB DATE 73

NOTE 77p.

EDRS PRICE MF-$0.83 HC-$4.67 Plus Postage.

DESCRIPTORS Advisory Committees; *Auto Mechanics; *Auto Mechanics (Occupation); Career Opportunities; Cooperative Programs; Curriculum Guides; *Educational Specifications; Equipment; Facility Requirements; Occupational Guidance; *Program Content; *Program Development; Program Evaluation; *Program Guides; Program Planning; School Industry Relationship; Teacher Education; Teacher Recruitment; Trade and Industrial Education; Vocational Counseling

ABSTRACT

The book, prepared for educators and industry, was designed as a complete guide to establishing an automotive training program. The 10 sections describe the following aspects of program planning and implementation: (1) career opportunities in automotive service; (2) guidance, counseling, placement, and followup; (3) school, parent, emPloyer, industry relationships; *4) the automotive curriculum (includes course descriptions and instructional guidelines for each curriculum level); (5) plan for service performed at the institution's facility; (6) cooperative vocational education; (7) program evaluating; (8) teacher recruitment and education; (9) facilities (detailed design for an automotive school laboratory); and (10) tools, supplies, and equiPment (includes a 14-page, two-column list of tools, supplies, and equipment with descriptions and suggested quantities). Sample forms for a cooperative training plan conclude the guide. (Author/MS)

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Career Development STANDARDS

for vocational AUTOMOTIVE service instruction

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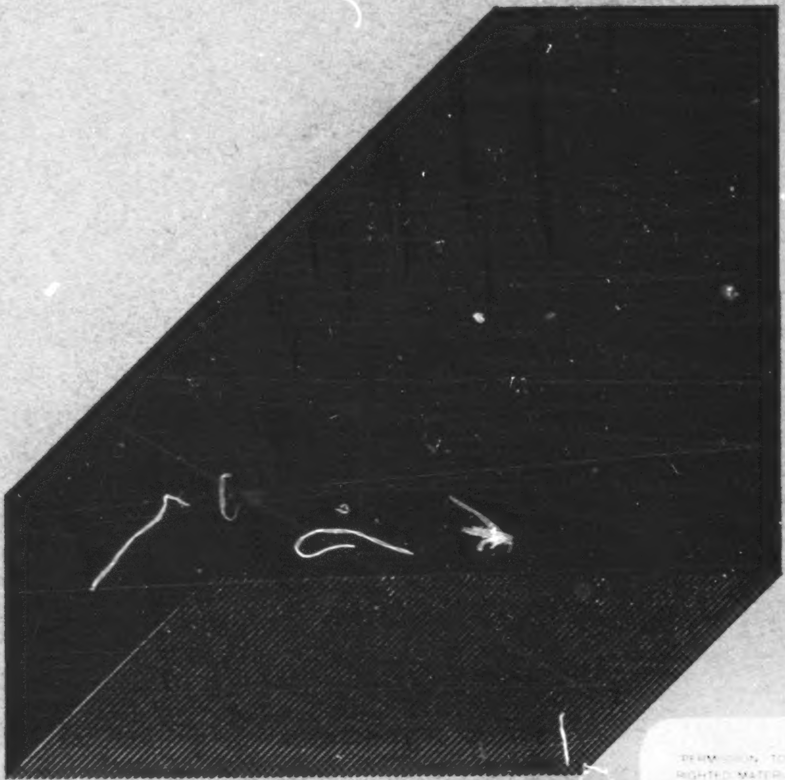

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Career Development Standards for Vocational Automotive Service Instruction

Prepared for educators and industry as a special project of the Motor Vehicle Manufacturers—American Vocational Association Industry Planning Council in cooperation with the Service Managers Committee, Motor Vehicle Manufacturers Association of the United States, Inc., 320 New Center Building, Detroit, Michigan 48202

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FOREWORD

Tempus certainly does fugit. This fifth edition represents over twenty-six years of close and continuous cooperation between vocational educators and the manufacturers of automotive vehicles. That is an unmatched record.

This rewarding association had its genesis at the 1946 convention of the American Vocational Association in St. Louis. At the auto mechanics section meeting, Andy Althouse, Supervisor of Vocational Education in Detroit, proposed a resolution that A. V. A. seek the support of the automotive industry to discuss the setting of standards for automotive instruction in public schools. A committee of educators was formed, and since I was the only industry representative at the meeting I agreed to form an industry committee to act as advisors.

By 1951 the two groups, working together, had produced a series of eight reports. They were made available upon request through A. V. A. The reports covered such subjects as curriculum, selection of students, teacher training, shop layout, and tool and equipment recommendations.

The first publication to be distributed nationally by the committee was entitled "Automotive Instruction in Your Community." It was sent not only to schools teaching auto mechanics but to all car and truck dealers. It was an effort to make school administrators aware of the needs of industry and to promote cooperation between automobile dealers and schools at the local level.

The eight reports and the booklet were so highly successful that the Automotive Industry-Vocational Education Conference Group decided that there was a great need to publish a single book to encompass all that we had learned and to be a complete guide to establishing an automotive training program.

Shortly after that the first "Standards for Automotive Instruction in Public Schools" was published. This is the fourth rewritten and updated version of that initial offering.

Literally hundreds of people have taken part in this task since it began, both from industry and education. It has been a most rewarding experience for all. Lasting friendships have been made. Through mutual understanding of problems we have all contributed toward helping each other. No major industry involves itself more in education than the automotive: through the donation of vehicles and components; through the Summer Workshops for teachers; and through participation in Career Day programs. All are outgrowths of that long-ago meeting of the American Vocational Association in 1946, and Andy Althouse's good idea.

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SECTION 1

CAREER OPPORTUNITIES IN AUTOMOTIVE SERVICE

A REWARDING CAREER

The motor vehicle is a national necessity, as shown by the 112 million vehicles in use on America's streets and highways. Automotive manufacturers estimate that 125 million vehicles may be in use by 1975.

The service maintenance requirements of these millions of vehicles have created a major business that is steadily growing.

In fact, Americans spend billions of dollars each year for automotive parts and service labor. The total amount actually exceeds the annual cost of all motor vehicles sold.

Such a volume of service business creates increasing employment opportunities and offers a wide range of interesting and profitable careers for capable young people.

The most effective way to meet the expected demand for motor vehicle mechanics, technicians, and teachers is to counsel students regarding these opportunities.

A WIDE RANGE OF OPPORTUNITIES

Working in the motor vehicle service industry can bring a young person the satisfaction of knowing he is performing an important job for the motoring public. He experiences the personal satisfaction of using sophisticated test equipment and special tools to diagnose an owner's service problem and perform the necessary repairs.

For the skilled mechanic there is job security, job versatility, and unlimited opportunity for advancement.

Working conditions in modern service facilities influence the mechanic to produce quality work on a continuing basis. Most service facilities are clean, well-lighted, well-ventilated, and are equipped with labor-saving tools and up-to-date test equipment.

The improvements made in motor vehicles every year make service work more exciting by creating new challenges and a need for various kinds of service specialists.

To the young person with ability, aptitude, educational background, and practical experience, a career in motor vehicle service offers virtually unlimited opportunities, unlimited challenges.

Let's consider some of the careers an individual can pursue when he has acquired the necessary education, experience, and skill in automotive service.

GENERAL MECHANIC

A General Mechanic is expected to perform competently a broad range of motor vehicle service work in accordance with the needs of the service facility's customers. His skill depends upon a sound education and experience, plus additional training to upgrade skills and keep abreast of the changes continually occurring in the field. The mechanic must be able to locate trouble through careful diagnosis, and then perform repairs—correctly and efficiently—using whatever special tools and equipment are necessary.

SPECIALTY MECHANIC

This individual is a service specialist in a specific phase of repair work. Service specialties include such operations as engine tune-up, electrical system maintenance and repair, carburetion tuning, body work, automatic transmission repair, front-end alignment, and wheel balancing.

SHOP FOREMAN

In a large dealership, an independent service facility, or a transportation company garage, the Shop Foreman supervises the work of the servicemen. He should be a skilled mechanic himself, and also be capable of carrying out supervisory responsibilities. His work involves the scheduling and routing of repair work, training personnel, and inspecting completed jobs—in short, making certain that quality work is performed and that the service operation is efficient.

SERVICE ADVISOR-WRITER

In a dealership service department, this is the person who greets the customer, determines his service needs, and writes the repair order. He should create good customer relations, be a skilled salesman, and have considerable knowledge of the vehicle and how to service it properly. He must be able to diagnose troubles and specify exact corrective procedures on the repair order. He must also be familiar with labor rates, and possess a working knowledge of parts and parts prices.

SERVICE MANAGER

The service department of a dealership or other service facility is headed by a Service Manager who supervises the overall operation and is responsible for customer satisfaction. The Service Manager must be a good administrator. He must have the ability to build employee teamwork and morale, and create good customer relations. In addition to operating a profitable and efficient service operation, he must know how to use advertising and sales promotion to increase business volume.

PARTS MANAGER

The responsibilities of the Parts Manager include ordering, stocking, and selling quality replacement parts and accessories. He supplies the servicemen in the facility with the parts needed to perform repairs. He operates both a retail and wholesale business, and must make decisions concerning customer qualifications for wholesale prices. The Parts Manager must also be a skilled salesman and know how to build good customer relations. He must know the parts business and follow recommended parts-ordering procedures. Education in automotive mechanics and training in parts sales are valuable experiences for this job.

VEHICLE SALESMAN

This is the job for an individual interested in selling passenger cars and trucks. Motor vehicle service experience provides an excellent background for a career in vehicle sales. The salesman who has sound technical knowledge of the vehicles he sells can usually do an excellent job in explaining features and demonstrating vehicles.

VEHICLE SALES MANAGER

The top position in the retail sales phase of the motor vehicle business, this job is usually held by an individual who has achieved success in sales work and has managerial ability.

JOBBER SALESMAN

The Jobber Salesman is the representative of a parts wholesaler. He travels an assigned territory, selling products of a number of manufacturers to various types of service facilities.

EMPLOYMENT WITH MOTOR VEHICLE MANUFACTURERS

Qualified young people are hired by motor vehicle manufacturers in such areas as factory sales, service field organizations, and service training operations. In addition, job opportunities abound in motor vehicle manufacturing plants, including: Final Assembly Inspector, Final Assembly Repairman, Engine Block Tester, Experimental Driver, Driver-Mechanic, and Engineering Garage Mechanic and Repairman.

TRUCK OR BUS DRIVER

More than 9 million persons are employed as Truck and Bus Drivers. They make up the second largest occupational category in America. Many operators of truck or bus fleets prefer their drivers to have training and experience in motor vehicle mechanics. Such drivers know the importance of proper maintenance, and can diagnose trouble and make emergency repairs.

INSURANCE ADJUSTER AND CLAIMS EXAMINER

Insurance companies need young people who can combine a knowledge of the insurance business with experience and educational background in automotive mechanics. Such people make excellent Insurance Adjusters and Claims Examiners.

SALES REPRESENTATIVE

Companies that sell products to motor vehicle manufacturers often employ people who began their sales careers after obtaining education and experience in automotive service.

OPERATORS OF SERVICE STATIONS OR SPECIALTY REPAIR SHOPS

Successful operation of a service station or specialty repair shop requires education and experience in motor vehicle mechanics.

MOTOR VEHICLE DEALER

This is one of the most important posts in the motor vehicle industry. Often a leader in his community, the Motor Vehicle Dealer owns and operates his own business—selling and servicing vehicles produced by the manufacturer he represents. Many Dealers started their careers as motor vehicle mechanics.

VOCATIONAL INSTRUCTOR

Teaching in a public school in the motor vehicle industry is a rewarding profession for those who qualify. Teaching in high school, or in post-high school institutions, usually requires technical and professional training beyond the high school level. Teaching at the college level usually requires at least a bachelor's degree. The Service Training Instructor in industry teaches new diagnostic techniques, service procedures, and special tool usage to service facility personnel, and provides them with information on new products.

CAREER OPPORTUNITIES FOR WOMEN IN MOTOR VEHICLE SERVICE

Until very recently, career opportunities for women in the motor vehicle service industry were quite limited. But times are changing. Today, a steadily increasing number of women are finding satisfying careers in the various occupations outlined above. The motor vehicle service industry welcomes this development, and encourages more young women to investigate these career opportunities.

* * * * *

The job opportunities described above show that education and experience in motor vehicle mechanics can be keys to success in a number of rewarding careers. Motor vehicle service is a many-sided business that offers a multitude of opportunities to the student who has the desire, the training, and the ability to succeed in this challenging occupational field.

SECTION 2

GUIDANCE, COUNSELING, PLACEMENT, AND FOLLOW-UP

2.1 INTRODUCTION

In addition to providing students with instruction and technical skills, administrators, teachers, and counselors accept the important responsibility of helping each student determine his best occupational potential.

From the early years onward, students, as well as many persons already in the work force, naturally wonder—"How am I going to earn a living?"—"What kinds of work can I do?"—"What kinds of work will I enjoy and in what career can I hope to be successful?"—"What kinds of education and training and other life experiences will be most relevant for me?"

The planning and realization of a career requires that some important decisions be made. Students can be assisted in planning and developing their careers by obtaining accurate information and understanding about the broad range of opportunity, and the specifics of individual occupations being given serious consideration. Invaluable guidance toward these ends can be provided by instructors, experienced workers, and employers.

There is no magic formula which will determine whether automotive service is the best vocation for a given person. Any specific decision grows out of the impact of the person's general life experience and preceding educational program, as well as out of the specifics of immediate time, place, and circumstances and the images which the person holds about himself and the future. It is for these reasons that current test scores, aptitude data, and data about occupational and training requirements and outcomes, are most helpful in establishing the foundations of an effective, continual, career-education and guidance program.

Guidance should be considered as a long-range developmental program based upon the needs, growth, and characteristics of each individual student. Information assessing each student's progress in career development should be collected continuously. This information should be used by the student, parents, and school as a basis for the planning and providing of further experiences for the student's career development.

Arrangements should be made for personal counseling from time to time, so that the student can evaluate his progress as he achieves new insights into the requirements and satisfactions of his career development experiences. As he advances in his educational program, he should also have opportunities to use his new experiences and information to appraise and revise his specific vocational objectives. This is especially important in automotive service careers because of the many diversified employment possibilities.

In the exploratory stages of career development, the range of opportunities in industrial arts courses may stimulate and guide the student, providing him with certain occupational knowledge and performance skills. However, subsequent vocational training will be necessary for most persons in order to achieve the competency level required for entry into the job market.

The guidance process must recognize that a successful and satisfying career in automotive service involves much more than the mechanical ability to replace parts. The student must be familiar with the basic principles of all automotive components before he can accurately diagnose trouble and perform the proper corrective operation. This means that the prospective automotive mechanic must receive adequate technical education on many complicated vehicle components.

He must also have a knowledge of science and mathematics, good communication skills, an understanding of the theories and principles of automotive vehicle operation, and the ability to read schematic drawings.

2.2 STAFF GUIDANCE FUNCTIONS

Career development and guidance must be organized and implemented on a continuing basis: from kindergarten through adulthood. Correlatively, the ***total*** school staff and appropriate non-school persons must all make active and complementary contributions to these continuing processes. College-oriented school guidance and counseling programs, which have been given primary emphasis during the past dozen years or more, must be balanced by attention to the needs and talents of the total range of both students and prospective students not currently enrolled in school programs.

Each occupational-education setting and each school require one or more counselors specially qualified in career development, guidance, and counseling. As part of, or in addition to, the applicable standard requirements for counselor certification, many special qualifications are desirable. They include work experience in other than an educational setting; expert knowledge of career-development theory, competence in knowledge and use of occupational, educational and training information; and knowledge of student assessment methods for career planning and decision-making. Skill in using other in-school and community resources for career development—such as vocational and "academic" teachers, representatives of employers, workers, and the community at large—is also necessary. Appropriately trained and supervised paraprofessional personnel can be assigned selected duties within this range.

As in other vocational fields, the automotive instructor and the advisory committee should support and actively contribute their special knowledge and skills to both the planning and the execution of a comprehensive career-development and guidance program.

2.3 HELPING STUDENTS DETERMINE VOCATIONAL OBJECTIVES

The process of helping a student decide upon specific vocational training may require an extended period of time. During that time, the student should have collected information about possible jobs in the fields that interest him.

Job requirements vary a great deal and there are wide differences among students in abilities, interests, and personalities. Consequently, before a student chooses a specific career in the automotive service field, he should have accurate information about the work he desires to do and its prospects. In automotive service, this means learning about the wide range of jobs in a service establishment: general repairs, specialized repairs, the parts operation, the sales operation, and supervision. The student should get information about the purpose of work, the operations performed, the tools and materials used, hours worked, working conditions, pay rates, prospects for advancement, availability of additional training, and the other kinds of satisfactions and rewards of particular significance to himself that automotive service offers.

The student should then determine the advantages and disadvantages of each job in terms of his own needs and desires, the training and experience necessary for success, and the steps he should take to obtain the job he wants. The industrial arts teacher, counselors, and others presenting exploratory experiences, have excellent opportunities to assist a student during this stage of his progress.

2.4 GUIDANCE IS A CONTINUING PROCESS

Specific vocational objectives can only be established when all requirements of the various automotive service jobs have been considered and specific personal qualifications and aspirations for different jobs evaluated. "Final" decision on a vocation is difficult to make. At best, the choice represents a crystallization of significant factors practicable at a given time. The student must be aware that conditions may change, and that further evaluation of his developing abilities, interests, and other personal characteristics and needs may modify earlier objectives. A major goal of career development and guidance is to enable each individual to make such evaluations and decisions with progressively greater insight and skill.

2.5 BALANCED TRAINING

It should be the objective of an in-school, pre-employment, vocational-technical training program to provide a broad background in general knowledge and automotive skills, rather than narrow specialization. The student should have adequate instruction in communication skills, science, and mathematics, and as wide a range of training in automotive mechanics as possible. Specialized training makes it difficult for a student to adjust quickly to different products and service methods. With broad training, however, the student can more readily make adjustments to fit the requirements of the job.

2.6 PLACEMENT AND FOLLOW-UP

Every secondary school, as well as post-secondary institutions, colleges, and vocational-technical schools, should provide placement services. They should be responsible for job placement and follow-up of persons who (a) have completed or are about to complete a program of education; (b) need work experience as an integral part of their educational program; and (c) require part-time employment to remain in school.

In addition to ***preparing*** for employment through cooperative education and other in-school vocational programs, schools should use employment as an essential, integral component of the learning experiences of many youths. Part-time employment and/or work-study experiences provide opportunities for direct exploration of occupational alternatives, for seeing relationships between academic studies and life in the real world, and for establishing those work habits and attitudes often called "employability."

Systematic follow-up of students, including "drop-outs," should have a dual purpose: (a) providing continuing assistance to the former student in his transition to work, to other forms of education or training, or return to school, as may be most appropriate; and (b) providing continual evaluation and feedback to a school of its former students' post-school experiences for purposes of upgrading the school's educational program for the benefit of present and future students.

The placement and follow-up services should be housed in the school, in close contact with students, teachers, counselors, and administrators. In addition, the services of available public and private employment agencies and other relevant community organizations should be coordinated with the school's placement service so as to avoid undue duplication and inefficiency. But merely referring job applicants to such outside services should not be considered an adequate substitute for the school's own placement responsibility.

The automotive service instructor's first-hand knowledge of individual automotive student's qualifications and specific employee hiring requirements gives him a unique role in the school's placement and follow-up program, both in terms of the placement of the individual students and in the planning and operations of the overall placement program. The automotive-service-program advisory committee also has a basic role in assisting in the placement and follow-up functions.

SECTION 3

SCHOOL, PARENT, EMPLOYER, INDUSTRY RELATIONSHIPS

3.1 INTRODUCTION

Close liaison between the school, the parents, and the local automotive service industry is the most important factor in establishing and promoting a successful, long-range automotive vocational program in any community.

3.2 PROGRAM BENEFITS

The dealer benefits by taking an active part in a school training program because his personal interest and efforts will attract competent students to his field. The school benefits by working closely with the dealer to establish more accurately the most valuable kind of training for youth. Through cooperation of this kind, courses can be made to include more specific information to meet local requirements, and instruction can be made more definite. The community benefits from having more technically trained and employable people. It permits the community to do two important things: retain existing businesses requiring technical personnel, and attract new business requiring technical personnel.

3.3 ORGANIZING AND CONDUCTING AN ADVISORY COMMITTEE

The most valuable aid to organizing and maintaining an effective program is an advisory committee made up of representatives from both the local school and the local automotive service industry. Such a group can keep a program practical, productive, and in line with local employment needs.

The advisory committee might include one or more local automotive dealers, a service parts manager, a service station operator/owner, an automotive mechanic, independent vendors, salesmen of service equipment, a local school official, an automotive teacher, and, in areas where the automotive service industry is unionized, a representative of labor and the Bureau of Apprenticeship and Training.

The person generally responsible for organizing the School-Auto Repair Industry Advisory Committee is the instructor or school coordinator. When a school has a small staff, this organizational work could be handled by the principal, the instructor-coordinator, or some other interested school official. The committee can be organized by the school representative as follows:

☐ Approach the local dealer organization, individual employers, service station operators or other automotive service establishments.

☐ Present a detailed plan for the formation of an advisory committee, and explain the purpose, objectives, activities, and potentially beneficial results.

☐ Request that representatives from the schools, the local service industry, and labor be appointed to serve on the committee so that all phases of the service business are represented.

☐ Offer the committee chairman and members guidance and counsel relative to the operation of service training programs and other functions. Many excellent resource booklets are available from state vocational departments and the United States Office of Education.

☐ The elected chairman should be given responsibility for assuring that committee meetings are held on a regularly scheduled basis and that decisions, recommendations, and activities are studied and utilized in the best interests of the program as they may pertain to school policy. It is also recommended that the committee chairman not be connected with teaching or school administration. A chairman from outside the school system helps create a more smoothly functioning committee by involving non-school members as leaders.

☐ The success of the School-Industry Advisory Committee depends to a large extent on the initiative and drive of the advisory committee. Advisory committee members are usually appointed for one year only, but may be reappointed.

3.4 ACTIVITIES OF THE ADVISORY COMMITTEE

The advisory committee will have many opportunities to combine the services of teachers, employers, parents, and students to promote meetings, get-togethers, contests, and other events which will get favorable public notice and attract outstanding young people to the automotive service business. The following activities are suggested:

Career Day Conference Participation

Career Days provide occasions when employers, other representatives of the automotive service industry, and schools can make effective presentations of the opportunities offered youth in the automotive service industry. They can do this by outlining the nature of the various service occupations, the training needed, and the rewards of making good on the job.

Open House Days at School

A special effort should be made to get employers to attend open house days at school during which they may inspect the facilities, meet the faculty, and get acquainted with the students and the curriculum.

Open House Days at Dealerships

Many employers hold "open house" for automotive teachers and students to show them service facilities. The occasion for the visit may be a preview of new models, a showing of a specialized vehicle of some sort, or screening of interesting movies about cars and trucks.

Cooperative Career Education

Teachers, employers, and students are brought into a close, businesslike relationship throughout the course of this learn-and-earn program. Teacher-employer cooperation, which is of special benefit to the students, is outlined in detail in Section 6.

Summer Employment of Teachers

Employment in an automotive service facility during the vacation period serves to keep a teacher up-to-date on current procedures, and also provides the dealer with a valuable addition to his service staff.

Policies Regarding Automotive Service Work Performed in the Schools

There should be an agreement among school administrators, employers, and advisory committee members concerning work done by the school which in any way affects the employers or the automotive repair industry.

Policies Regarding Purchase of Parts and Accessories for School Operations

School administrators, employers, and advisory committee members should also arrive at a cooperative agreement that will prove satisfactory in this area.

Evaluation of the School Automotive Service Program

Representatives of the advisory committee may help to evaluate the progress and usefulness of the school automotive service program by making periodic tours of the facilities and reviewing the equipment and instructional program. The recommendations resulting from this evaluation should be implemented in the career-education program to keep it in step with technological advances that affect automotive service operations.

Scholarships and Other Awards

Various service groups in the community may desire to provide college or service school scholarships, or other awards, for outstanding students as an incentive for achievement.

Contests

A proven way to stimulate interest and effort in automotive training is to conduct contests of various kinds among the students. The prospect of keen competition is an incentive for students to sharpen their technical skills. Moreover, contests provide an excellent way to publicize training programs and to give recognition to outstanding students.

It is always wise to secure approval from state or city school authorities for a statewide or citywide contest. When such authorities are familiar with a school's contest plans, it is usually easier to get approval and recognition year after year.

3.5 DEALER-TEACHER COOPERATION

In some localities instructors attend meetings at dealership service departments. They also attend factory-conducted service training schools and clinics held at automotive repair facilities and factory training centers. By attending such functions, the instructor can learn at firsthand the very latest service procedures and obtain knowledge that he can apply to bring his training program up-to-date.

Motor vehicle dealers usually have access to many types of useful training materials—e.g. slide films, shop manuals, motion pictures, charts, and technical literature—which they can provide to schools. Quite often, they have usable components which can also be made available for instructional purposes.

Occasionally, motor vehicle manufacturers have products and product components which they can provide, at a nominal cost, to career-education institutions. For more details, inquire at local dealerships or write (on school letterhead) to individual motor vehicle manufacturers.

All of these activities tend to bring teacher and employer together in ways that strengthen mutual interests and create friendly relations—to the benefit of both the school and the employer.

SECTION 4

THE AUTOMOTIVE CURRICULUM

4.1 SCOPE OF TRAINING

There are basic concepts and operational procedures that should be part of any automotive service program. These elements, along with practice in typical repair procedures, should be the foundation of the training a school provides the student.

The service program should be phased and presented in a manner that will allow the expansion of each student's knowledge and manipulative skills to be maximized.

Initial instruction should be developed through teaching and learning situations on laboratory demonstration units, followed by instruction on "live" vehicles. This method of organizing automotive instruction will result in more effective training.

Cooperative programs with automotive service establishments should be considered as an integral part of the program.

Automotive service is a growing field with a definite need for qualified personnel in many job classifications, extending from the need for a person with highly developed mechanical skills to the individual having a high degree of technical ability. Careful counseling and guidance is important to assure that the person possessing the necessary mental ability, interest, mechanical aptitude, and manual dexterity is given every opportunity to enroll in courses commensurate with his ability.

4.2 PROGRAM OBJECTIVES

All good curricula have program objectives. Following are the basic, minimum objectives which should be expanded and tailored to each situation.

☐ To develop in students the ability and desire to live and work harmoniously with mutual respect for each other's rights.

☐ To develop in each student an understanding of the mechanical and scientific principles involved in the automobile.

☐ To develop the ability to use and care for the basic automotive tools and equipment.

☐ To develop sufficient skills and related technical knowledge of automotive service to meet job entry requirements with a sound base for growth within the trade.

☐ To develop logical, step-by-step diagnostic procedures.

☐ To encourage good work habits of orderliness, cleanliness, and care of property.

☐ To develop safe work habits and to promote safety consciousness.

4.3 DEVELOPING AN AUTOMOTIVE SERVICE CURRICULUM

The automotive industry requires a continuous supply of young people who possess a sound, general educational background that can be integrated into a specialty area.

Establishment of a successful automotive curriculum in the school requires consideration of the following factors:

Local industry needs;
Student interest and needs;
School facilities;
Qualifications;
Budget availability;
Qualified advisory committee influence.

A planned curriculum—i.e., the aggregate of all courses needed to fulfill certain educational and training requirements—is required for the student of automotive service in order for him to continue his education in more specific areas or to qualify for successful employment in this highly specialized field. Substitution of a generalized curriculum may result in the lack of basic job competencies needed when the student seeks employment. Therefore, the overall aim of the suggested automotive curriculum is to provide the minimum educational and training requirements necessary for the student to enter the job market and to progress in the field of motor vehicle service.

4.4 CURRICULUM COURSE DESCRIPTION

This curriculum was shaped to accomplish two major objectives: (1) To provide flexibility that would enable the curriculum to apply to any program in any setting; (2) To match technical content to job descriptions in the ***Dictionary of Occupational Titles*** (hereafter referred to as DOT) at three successively higher levels of competency. Motor vehicle manufacturers do not accept the DOT standards as rigorous and binding in every case. Nevertheless, they are sound recommendations for school administrators to be guided by when planning an automotive service program.

The Curriculum Levels are:

I. Automotive Service Station Attendant;
II. Automotive Service Station Mechanic I;
III. Automotive Mechanic.

There are numerous specialists jobs which can be taught in addition to the three basic courses outlined herein. See Section I for details. Completion of Curriculum Level III, Automotive Mechanic, will give the student an excellent base from which to pursue a specialty of his choice. It is not necessary, however, for the student to complete Level III to qualify for another occupational classification. Please refer to the DOT for further descriptions.

The student who wishes to complete and exit from the program at the end of Curriculum Level I, Automotive Service Station Attendant, will have a curriculum consisting of 180 contact hours in technical subjects. To proceed through Level II, Automotive Service Station Mechanic I, and exit there, his program would include the 180 hours of Level I plus the additional 360 hours of Level II, making a total of 540 hours. If the student desires to take the entire package and complete Level III, Automotive Mechanic, his program would be the summation of Curriculum Level I (180 hours), plus Curriculum Level II (360 hours), plus the additional 540 hours of Curriculum Level III, for a total of 1080 hours.

The recommended number of hours for each Curriculum Level is considered a minimum. Wherever possible, additional time should be added to each level so that individuals may be better qualified for job entry as specified in this document.

It is recommended that a maximum of 25% of the total time allotted be devoted to class or theoretical work. The remaining 75% of the time should be devoted to "hands-on" experiences.

In addition to the development of skills indicated in the course content, it is imperative that a thorough understanding of the principles and operation of each unit be included.

Figure 4A on page 13 is a breakdown of hours and the percentage of the total hours for each Curriculum Level. This should assist curriculum planners in developing programs suited to meet particular needs.

The following are the skill levels based on the DOT description to be attained at the completion of each Curriculum Level:

CURRICULUM LEVEL I:
Automotive Service Station Attendant
(DOT 915.867)

The main emphasis in this curriculum

should be the "learn-by-doing" approach to instruction. The student will have job-entry skills at the service station level and the prerequisites to continue into Curriculum Level II. Upon completion of Curriculum Level I, the student will be able to perform the following job duties as described in the DOT 915.867:

> *Service automobiles, buses, trucks, and other automotive vehicles with fuel, lubricants, water, replacement parts, and accessories; (fill tank of vehicle to level specified by customer). (Clean windshield and windows) and observe fluid level in crankcase, radiator, and battery, and add required amount of oil or water. (Visually) inspect vehicle during service, notify customer of defects and impending problems such as worn tires, or deterioriating radiator hose or fittings, and sell replacement parts and service when appropriate. Lubricate vehicle and change oil in engine (LUBRICATION MAN). Replace parts and accessories, such as oil filter, air filter, fan belt, pressurized radiator cap, and windshield-wiper blade assemblies. Test and flush cooling system and add antifreeze. Change spark plugs. Repair or replace tires, (using impact wrench and pneumatic tire changer). Replace lights, (and wash and wax vehicle). (Collect payment for services and supplies in cash or by completing credit card sales form.) (Sell batteries and other items such as car waxes and additives usually found in service stations. Clean interior and pump area of station. May assist in arranging displays, taking inventories, and making daily reports.)*

CURRICULUM LEVEL II:
Automotive Service Station Mechanic I (DOT 620.381)

Curriculum Level II is designed as a continuation of Curriculum Level I with additional in-depth study of each unit of the automobile. Completion of this curriculum level will provide the students with job-entry skills at the beginning apprenticeship levels and fulfill the prerequisites for the third curriculum level.

Upon completion of Curriculum Level II, the student will be able to perform the following duties as described in the DOT 620.381:

> *Perform minor repair and tune-up of automotive vehicles. Remove and replace spark plugs, ignition contact points, and condenser, using hand tools. Attach leads of electronic engine tester, or of voltammeter and timing light, and make minor adjustments on carburetor and timing to improve performance, using hand tools. Service, replace, and adjust electrical and fuel system components, according to manual specifications, using special and standard hand tools. Clean and adjust throttle and choke linkages. Replace components, such as shock absorbers, brake shoes, wheel bearings, lights, radiator caps, batteries, and filters. Adjust brakes to remedy minor defects. (Remove, repair, and replace tires and tubes, using impact wrench and pneumatic tire changer.) Replace defective components of exhaust system. Lubricate (LUBRICATION MAN), refuel, test, and service cooling system of vehicles. When working in a service station, usually designated AUTOMOBILE-SERVICE-STATION-MECHANIC.*

CURRICULUM LEVEL III:
Automotive Mechanic (DOT 620.281)

Curriculum Level III is designed as a continuation of Curriculum Level II. It will cover the entire automobile in greater detail, providing the student with the skills and knowledge to enable him to perform diagnisis and repair of various automotive components. This course will enable the student to enter the automotive service field at the advanced apprenticeship level.

Upon completion of Curriculum Level III, the student will be able to perform the following duties as described in the DOT 620.281:

> *Repair, overhaul, and maintain automotive vehicles by applying knowledge of service procedures, and using hand and power tools and specialized automotive equipment; dis-*

Figure 4-A

SUGGESTED AUTOMOTIVE CURRICULUMS HOUR AND PERCENTAGE BREAKDOWN

Subject Matter	Level I		Level II		Level III		Levels I, II, III	
	Hours	Percent	Hours	Percent	Hours	Percent	Hours	Percent
Orientation	15	8.3	5	1.4	5	1.0	25	2.3
Cooling & Heating	20	11.1	30	8.3	15	2.8	65	6.0
Electrical	30	16.7	100	27.8	120	22.2	250	23.5
Wheels & Tires	30	16.7	20	5.6	0	0	50	4.6
Steering & Suspension	15	8.3	45	12.5	45	8.3	105	9.7
Brakes	15	8.3	50	13.9	20	3.7	85	7.8
Engines	20	11.1	10	2.8	55	10.1	85	7.8
Fuel, Exhaust & Emissions	15	8.3	80	22.2	80	14.8	175	16.1
Drive Train	15	8.3	15	4.1	195	36.1	225	20.8
Merchandising	5	2.9	5	1.4	5	1.0	15	1.4
Totals	180	100.0	360	100.0	540	100.0	1080	100.0

CURRICULUM LEVEL I – 180 Hours
CURRICULUM LEVEL II – 540 Hours (LEVEL I + 360 Hours)
CURRICULUM LEVEL III – 1080 Hours (LEVEL II + 540 Hours)

cuss with customer or read work order, and examine and test vehicle to determine nature and extent of repair or services required. Remove units, such as engine, transmission, truck transfer case, or differential, using wrenches, hand tools, and hoist. Dissemble unit, using special and standard tools, and inspect parts for wear and defects, visually and by using micrometers and gauges. Repair or rebuild units, using hand, power and machine tools, considered a specialty operation today, depending on nature of work. Replace units in vehicle, and align and secure, using hoist and hand tools. Tune engine, test functioning of vehicle with electronic diagnostic equipment and dynamometer. Repair and overhaul other standard automotive systems such as cooling, electrical, fuel, exhaust, and steering systems, and specialized units such as driving axles of trucks, and pneumatic door opening mechanisms of buses. Record work done and parts and materials used, on work order or job ticket, and vehicle condition report. May be designated according to specialty as BUS MECHANIC; FOREIGN-CAR-MECHANIC; TRUCK-MECHANIC.

4.5 INSTRUCTIONAL GUIDELINES FOR EACH CURRICULUM LEVEL

ORIENTATION: SHOP AND PERSONAL SAFETY

Curriculum Level I—15 Hours

Description: Students should be taught all phases of shop and personal safety as practiced in the automotive service industry and defined by local or state and other safety regulatory agencies.

School and shop regulations and personal safety practices must be an integral part of all segments of the program.

An overview of opportunities in the automotive service industry should be presented.

Curriculum Level II—20 Hours
(Level I and 5 Hours)

Description: Level II will be based upon the information presented in Level I with emphasis on the proper use of advanced equipment, in-depth study of occupational employment information, and methods and procedures for obtaining employment.

Curriculum Level III—25 Hours
(Level II and 5 Hours)

Description: Level III is based upon the information presented in Levels I and II with greater depth and emphasis on job descriptions, employment procedures, specific information concerning methods of applying for employment, and advancement opportunities.

COOLING AND HEATING

Curriculum Level I—20 Hours

Description: The student will be given a basic program so he may understand the theory and operation of the air and liquid cooling systems, passenger heating systems, and air conditioning systems.

Student will be able to:

1. Check and correct coolant level;
2. Replace and/or adjust belts;
3. Check and test caps, thermostats;
4. Inspect and replace hoses.

Curriculum Level II—50 Hours
(Level I and 30 Hours)

Description: Level II is dependent upon the knowledge and skills taught in Level I. This level includes a more in-depth study of passenger heating systems, and related control systems.

Student will be able to:

1. Check and replace water pumps;
2. Check and replace thermostats;
3. Check and replace heater controls;
4. Check air conditioner for satisfactory operation;
5. Pressure test cooling systems.

Curriculum Level III—65 Hours
(Level II and 15 Hours)

Description: Level III is a continuation of the education and knowledge of skills previously learned in Levels I and II. Level III will add the skills of installation, servicing, and trouble shooting of air conditioners.

Student will be able to:

1. Install air conditioning unit;
2. Charge and test air conditioning units;
3. Repair or replace air conditioning components;
4. Perform diagnosis and trouble shooting of air conditioning units;
5. Repair cooling system components.

ELECTRICAL

Curriculum Level I—30 Hours

Description: Basic electrical theory and nomenclature of the electrical components will be taught as well as how to perform minor service on the electrical system units. Minor servicing of electrical components will be completely covered at this level.

Student will be able to:

1. Service batteries: test, charge, maintain, replace cables;
2. Service charging system output, adjust belt, replace belt;
3. Service spark plugs: clean, gap, or replace;
4. Service and lubricate distributors;
5. Replace minor electrical units: head lights, tail lights, panel lights, fuses, and flasher units;
6. Check spark plug wiring; replace and clean distributor cap towers, wiring, and other minor electrical units.

Curriculum Level II—130 Hours
(Level I and 100 Hours)

Description: Level II is a continuation of Level I with theory being examined in greater depth to improve diagnosis of the system's problems. Electrical service procedures for the overhaul of electrical units will be expanded at this level. Considerable use of electrical diagnostic equipment in locating system malfunctions will be stressed.

Student will be able to:

1. Perform complete engine tune-ups, bench testing, and overhaul procedures;
2. Repair and replace starters, alternators, distributors, regulators, and electrical motors;
3. Diagnose and correct electrical wiring malfunctions;
4. Perform electrical safety checks and correct the malfunctions;
5. Replace points and condenser.

Curriculum Level III—250 Hours
(Level II and 120 Hours)

Description: Level III is a continuation of Levels I and II. Level III is an in-depth study of more complex electrical components and the theory that is needed to understand them, along with more sophisticated electrical testing procedures.

Student will be able to:

1. Service electronic ignition systems;
2. Service such electrical accessories as power windows, warning lights, automatic headlamp controls, automatic speed controls, and similar units;
3. Service electrical components of air conditioning units.

WHEELS AND TIRES

Curriculum Level I—30 Hours

Description: Basic knowledge of tires and wheels, including repair and replacement procedures, will be covered at this level.

Student will be able to:

1. Identify tire and rim type and size;
2. Remove and replace tire, tube, and rim assembly;
3. Use impact tools;
4. Understand and execute torquing procedures;
5. Use tire changer to remove and replace tires and tubes;
6. Repair tires or tubes;
7. Recognize both causes and remedies of abnormal tire wear.

Curriculum Level II—50 Hours
(Level I and 20 Hours)

Description: Level II is a continuation of the information gained in Level I.

Student will be able to:

1. Perform front wheel bearing service: remove, clean, lubricate, replace, and adjust;
2. Inspect and replace wheel assembly, measure run-out, and inspect for flaws;
3. Perform static and dynamic wheel balancing on and off car;
4. Diagnose tire and wheel malfunctions;
5. Remove and replace front and rear wheel studs.

Curriculum Level III—50 Hours

Additional training, particularly wheel alignment, is covered under Steering and Suspension in Curriculum Level III. See page 16.

STEERING AND SUSPENSION

Curriculum Level I—15 Hours

Description: The instruction will include the identification of manual and power steering assemblies as well as routine maintenance operations.

Student will be able to:

1. Lubricate steering and suspension components;
2. Check and adjust power steering belt tension;
3. Check and correct power steering fluid levels.

Curriculum Level II—60 Hours
(Level I and 45 Hours)

Description: Level II is a continuation of the knowledge and skills developed in Level I. Minor steering component replacement should be taught as well as an introduction to the theory of steering geometry.

Student will be able to:

1. Replace tie rod ends;
2. Replace center links;
3. Replace idler arm;
4. Replace shock absorbers.

Curriculum Level III—105 Hours
(Level II and 45 Hours)

Description: Level III is a continuation of the knowledge and skills developed in Levels I and II. This level will include additional indepth training in steering and suspension components.

Student will be able to:

1. Diagnose steering and suspension problems;
2. Repair and replace coil springs and torsion systems;
3. Perform caster, camber, and toe-in adjustments to manufacturer's specifications;
4. Replace ball joints, torsion bars, coil springs, leaf springs, upper and lower control arms, rod ends, and bushings;
5. Repair or replace standard or power steering components.

BRAKES

Curriculum Level I—15 Hours

Description: The student will acquire a basic knowledge of brake fundamentals.

Student will be able to:

1. Identify types and grades of brake fluids;
2. Check master-cylinder fluid unit and fill to proper level;
3. Inspect brake lines for condition and leaks;
4. Inspect pedal height and perform adjustment;
5. Inspect parking brake operation.

Curriculum Level II—65 Hours
(Level I and 50 Hours)

Description: Level II is a continuation of the information previously gained in Level I.

Student will be able to:

1. Adjust service and parking brakes;
2. Check and replace brake shoes and disc pads;
3. Service drums, calipers, or rotors;
4. Bleed brakes using tank bleeders.

Curriculum Level III—85 Hours
(Level II and 20 Hours)

Description: Level III is a continuation of the learning process of those items previously learned in Levels I and II. Total system diagnosis and repair is taught in Level III.

Student will be able to:

1. Diagnose brake system problems;
2. Overhaul hydraulic brake system components:
3. Overhaul power brake unit;
4. Service drums, calipers, or rotors.

ENGINES

Curriculum Level I—20 Hours

Description: The understanding of the operation, theory, nomenclature, and basic construction of various types of automotive engines, including fuels, combustion, and lubrication.

Student will be able to:

1. Check fluid levels;
2. Change oil and air filters;
3. Perform normal preventive maintenance.

Curriculum Level II—30 Hours
(Level I and 10 Hours)

Description: Level II is dependent upon having the basic knowledge and skills previously mentioned in Level I. Student will make such minor repairs to automotive engines as gasket, seal, and component replacement. The proper use of basic diagnostic equipment, such as compression gauges and leak testers, will also be taught in this section.

Student will be able to:

1. Replace gaskets;
2. Replace outside seals;
3. Replace manifolds;
4. Replace motor mounts.

Curriculum Level III—85 Hours
(Level II and 55 Hours)

Description: Level III examines more advanced theory of internal combustion, rotary, diesel, 2-cycle and 4-cycle, air- and liquid-cooled, internal-combustion engines. Student will also be exposed to the engine reconditioning equipment commonly found in job shops.

Student will be able to:

1. Service cylinder heads;
2. Service valve trains;
3. Measure and service cylinders and replace piston rings;
4. Check and replace bearings;
5. Remove and replace engines.

FUEL, EXHAUST, AND EMISSIONS
Curriculum Level I—15 Hours

Description: Information concerning inspection and replacement of air cleaners, heat risers, valves, and exhaust systems will be covered at this level.

Student will be able to:

1. Change air filters;
2. Service PCV system;
3. Service heat riser;
4. Replace fuel filter.

Curriculum Level II—95 Hours
(Level I and 80 Hours)

Description: Level II will be dependent upon the information presented in Level I, with the principal focus on developing a thorough understanding of the principles of carburetion, exhaust, and fuel delivery systems and components.

Student will be able to:

1. Test and replace exhaust system components;
2. Perform minor adjustments;
3. Check and adjust automatic choke for proper operation;
4. Check and replace fuel delivery system components.

Curriculum Level III—175 Hours
(Level II and 80 Hours)

Description: Level III is dependent upon the information and skills presented in Levels I and II. Emphasis is placed on the diagnosis and service of carburetors, fuel pumps, fuel gauges, tank units, and emission control devices.

Student will be able to:

1. Overhaul carburetors;
2. Diagnose fuel system malfunctions;
3. Diagnose and repair individual manufacturer's emission-control system components.

DRIVE TRAIN
Curriculum Level I—15 Hours

Description: The standard and automatic transmission as well as the differential, clutch, and universal joint will be discussed.

Student will be able to:

1. Check fluid level in transmission and differential and fill to specification;
2. Select fluids for proper application;
3. Inspect universal joints.

Curriculum Level II—30 Hours
(Level I and 15 Hours)

Description: Level II will be a continuation of information found and presented in Level I with the additional knowledge and skills necessary to diagnose drive train problems.

Student will be able to:

1. Adjust or replace clutch pedal freeplay;

2. Service universal joints;

3. Replace rear axle bearings and seals.

Curriculum Level III—225 Hours
(Level II and 195 Hours)

Description: Level III will encompass experience in the diagnosis, overhaul, and replacement of clutches, standard and automatic transmissions, and differentials (standard and limited slippage).

Student will be able to:

1. Overhaul automatic and standard transmissions;
2. Overhaul standard and locking differentials.

MERCHANDISING AND BUSINESS PRACTICES

Curriculum Level I—5 Hours

Description: Job habits, personal grooming, customer relations, service-order writing, and money and credit card handling will be taught in this unit.

Curriculum Level II—10 Hours
(Level I and 5 Hours)

Description: The information presented in Level I will be built upon and enlarged to include an introduction to basic bookkeeping procedures and automotive parts identification.

Curriculum Level III—15 Hours
(Level II and 5 Hours)

Description: Level III, Introduction to Inventory Control, Parts Ordering, and Service Management Techniques, will build upon the knowledge and skills developed in Levels I and II.

4.6 COURSES RELATED TO AUTOMOTIVE SERVICE

The complete automotive curriculum must contain courses in addition to the technical training described herein. The following suggested courses should be incorporated into the student's educational experience.

Communication Skills

A solid background in speaking and writing with emphasis on grammar, word usage, spelling, sentence structure, and composition is essential in any technical field. One of the industry's major challenges is to improve communication at all levels and in all facets of the business.

Technical vocabulary is essential in understanding shop manuals, service bulletins, and installation instructions, as well as in writing and understanding repair orders and product reports.

Emphasis should be placed on the need for and development of an analytical answer to problems through effective speaking and writing.

A valuable technique is to have technical papers graded by the automotive instructor for their technical accuracy and effectiveness and by the English instructor for sentence structure and correct application of principles.

Social Studies

All students must have a basic understanding of our society and the world at large. A study of industrial economics as related to the automotive field and service shop activities will add to the effectiveness of the automotive program.

Industrial Arts

Industrial arts is a part of a general education course in our industrial society and gives students a basic understanding of the use of tools, equipment, and mechanical procedures.

Mathematics

Shop mathematics for the student in the automotive curriculum should relate to actual automotive service procedures.

Science

Science training is needed by all students enrolled in the automotive program. The primary aim of the course is to give the automotive student the fundamentals necessary for an understanding of the basic laws of physics, the chemistry of materials, and the application of these principles to the motor vehicle.

Circuit Analysis, Schematics, Sketching

The amount of experience and knowledge required in the various automotive fields varies considerably. The automotive mechanic student needs training in circuit analysis, interpreting schematics, sketching, and interpreting charts and diagrams.

4.7 ADDITIONAL PUBLIC EDUCATION TRAINING PROGRAMS

In addition to preparing regular full- and part-time students for careers in automotive service, the basic curricula described in this section are designed to meet the needs of the school dropout, the unemployed, and the under-employed, and to upgrade the skills of employees already in automotive service occupations.

Classes can be set up in any suitable location either in an industrial establishment or a school facility. The courses can be tailored to meet local needs and organized on a short- or long-term basis. School systems desiring to establish vocational programs should contact the administrator in charge of vocational education in their state's Department of Education.

Public schools should also offer instruction in automotive service geared to the needs of cooperative-education or adult-education programs.

4.8 FINANCIAL ASSISTANCE

Financial assistance is available to public schools to assist in the promotion, development, and expansion of vocational education programs through various Vocational Education Acts passed by the Congress. These programs of financial assistance are administered by the State Board for Vocational Education in each state in accordance with its State Plan for Vocational Education

Information and assistance in organizing and conducting vocational education programs are available from each state's Department of Education.

SECTION 5

SERVICE PERFORMED IN THE INSTITUTION'S FACILITY

5.1 INTRODUCTION

The reason for handling live service work in a school shop is to enhance student training. This training benefits future employers by providing the student with more realistic skills. The amount of service work performed, however, should not conflict or compete with local business interests.

5.2 BENEFITS OF PERFORMING REPAIRS ON "LIVE" VEHICLES

Work on live vehicles, doing actual service jobs, gives students an opportunity to apply what they have learned in contrast to the practice or pseudo-work they receive in assembling and disassembling school training units.

Vehicles to be serviced in the school may come from a variety of sources: teachers and students, outside customers, used car dealers, fleet operators, or even from outright purchase.

Vehicles can usually be obtained easily from teachers and students; such cars are also available for future checks when desired. When a school owns a vehicle, it can be used for any type of service at any time.

Vehicles from the general public or local fleet operators provide students an opportunity to work under conditions much like real service situations, with an opportunity to learn how to approach customers and provide them with service excellence. Student interest is usually stimulated by the prospect of working under these circumstances.

5.3 INSURANCE

The school must be insured for any contingency. For the school's protection, a signed release of liability should be obtained from car owners and documentation of such should be provided.

5.4 DIAGNOSIS

When a vehicle is brought into the school shop for service, a complete diagnosis of troubles should be made by one of the students. He will make recommendations of work to be done. After agreement is reached with the instructor on what service is to be performed, an accurate repair order should be prepared.

A student's ability to diagnose troubles is a most important part of his training, and the instructor must be sure that his students receive training and develop skills in this phase of the program.

Some schools feature a plan whereby teachers' cars are brought in for a periodic diagnosis as part of a plan for preventive maintenance.

5.5 CONTENTS OF THE REPAIR ORDER

A repair order that is representative of the type used in auto repair facilities should be used. Check with local repair facilities for information on how to obtain a supply of repair orders.

The repair order should contain the following:

A. Information concerning vehicle and owner.

B. Accurate diagnosis and complete instructions to the mechanic.

C. Parts and labor.

D. Customer's signature to authorize repairs and subsequent testing of the vehicle.

E. Release from liability.

When diagnosing service needs and writing repair orders, the individual manufacturer's Service Manual, the Flat Rate Manual, and the Parts Book can be very helpful. Instructions to the student mechanic should include the Flat Rate Manual operation number and the name of the operations to be performed.

5.6 PRICES CHARGED CUSTOMERS

Only parts which meet manufacturers' specifications should be used in the school facility. Only those parts actually installed during the training session should be invoiced. The charges for parts should be comparable to the prices charged by local automobile parts distributors, plus state and local taxes when applicable.

Flat rate times for various service operations are based on work by experienced mechanics, following procedures outlined in the manufacturer's manual and using whatever special tools are applicable. Naturally, students should not be expected to do service jobs in the flat rate times recommended or to charge the customer based only on these times. The student should, however, strive to complete the work in the flat rate time, and use the flat rate as a gauge of his own performance.

5.7 ACCOUNTING PRACTICES

The finances involved in the operation of an automotive service facility should be included in the general school accounting procedures. It is suggested that the school cashier handle all money matters and receipts, so that students and instructors can be relieved of this responsibility.

5.8 SUGGESTIONS FOR THE INSTRUCTOR CONCERNING CUSTOMER SERVICE

Use organized diagnosis and testing methods to determine the exact repairs needed and to provide additional educational experiences for the students.

Write a clear, concise repair order covering the various service operations to be performed on each vehicle.

Don't start repairs on a vehicle without a precise, written repair order and a deposit to cover the cost of parts.

Make certain that the live work to be performed is compatible with curriculum units discussed or covered on bench projects and operations.

Set up a series of check points for each job and carefully check each operation before allowing the students to continue.

Protect the front seat, steering wheel, and fenders with appropriate covers.

Instruct the students about the exact jobs they are to perform.

Make a record of all parts used on the repair order.

Have the students record their time, the operations performed, and their names on each repair order.

Students should not be allowed in a vehicle unless they are assigned to work on it.

Permit no work to be done under a car or truck unless safety jack stands are in place.

Students should not raise a vehicle on a hoist until the instructor has checked its position on the hoist.

The car radios should not be played.

Remove the ignition keys when they are not needed.

Don't allow an engine to be started after repairs have been made unless the instructor is present.

Carefully and thoroughly check the completed work.

Clean the car thoroughly before delivery to the customer.

Never hurry a job for the convenience of a customer.

Only authorized and legally eligible students should drive customers' cars or trucks.

Release the car to a customer only after it has been checked carefully and completely, and signed off by the instructor.

5.9 WARRANTY REPAIRS

Warranty repairs are performed by a franchised dealer (except in emergencies) through an agreement with the manufacturer. Warranty repairs performed by other than an authorized dealer may jeopardize the vehicle owner's warranty; therefore, it is recommended that warranty repairs as such be excluded from repair services performed by the school.

Service parts are warranted in most cases by the seller. When service parts are purchased, check with the seller for information regarding the warranty on such parts.

SECTION 6

COOPERATIVE VOCATIONAL-EDUCATION

6.1 WHAT IS COOPERATIVE VOCATIONAL-EDUCATION?

Cooperative vocational-education is a method of combining classroom instruction with supervised, part-time employment which is planned to contribute to both the student's overall education and his employability. The student's in-school schedule is balanced between academic subjects required for graduation and subjects directly related to his career objective. Theories and principles learned in school are applied by the student during his time on the job. Work to be performed is usually similar to that undertaken by new workers in the occupation. It is planned in advance and documented in a training agreement. Performance and progress on the job are supervised and evaluated by the employer in cooperation with the school. The techniques of cooperative vocational-education programs are equally effective at both the secondary and post-secondary levels of instruction.

A vital factor in the success of a cooperative vocational-education program is a teacher-coordinator who can provide the motivating force in carrying out the objectives of the program. He is responsible for developing and maintaining the necessary cooperative relationships between school, employer, organized labor, students, parents, and the community at large. His major concerns are teaching the vocational curriculum in school, coordinating community resources which facilitate the career objectives of his students, and bringing to the attention of all concerned a full understanding of the benefits to be derived from the program.

6.2 PURPOSE AND VALUES OF A COOPERATIVE VOCATIONAL-EDUCATION PROGRAM

The primary purpose of cooperative vocational-education programs is to prepare students for gainful employment by providing relevant work experiences in a genuine work setting. The work experience phase of a cooperative automotive-service curriculum is part of a regular vocational instructional program and is designed to help students bridge the gap between school and full-time employment in the automotive service industry.

The combination of school instruction and on-the-job training aids the student to develop the skills, attitudes, habits, and technical knowledge which he needs to progress in his career at a more rapid pace. Students are able to identify with actual work requirements, increasing their desire to learn. The ability to get along with people in a work environment is recognized as one of the more significant outcomes of the employment experience.

Schools can meet the needs of more students for automotive service training by entering into cooperative arrangements with automotive service shops and utilizing their facilities and equipment for training purposes. Such arrangements foster good relations between the school and the local automotive service industry.

An effective program supplies the community with a basically trained employee; establishes the proper work attitudes for the future employee; develops in the employer a sense of responsibility for the education of youth; and builds cooperative and cordial relationships between employers and local schools.

The partnership created between the school and the local automotive industry prepares the student for a worthwhile career in the automotive service industry. The student is encouraged to continue to work, live, and accept his responsibilities as an adult member of his home community.

6.3 STANDARDS FOR A COOPERATIVE VOCATIONAL-EDUCATION PROGRAM

The following special conditions should be considered when establishing a cooperative vocational-education program:

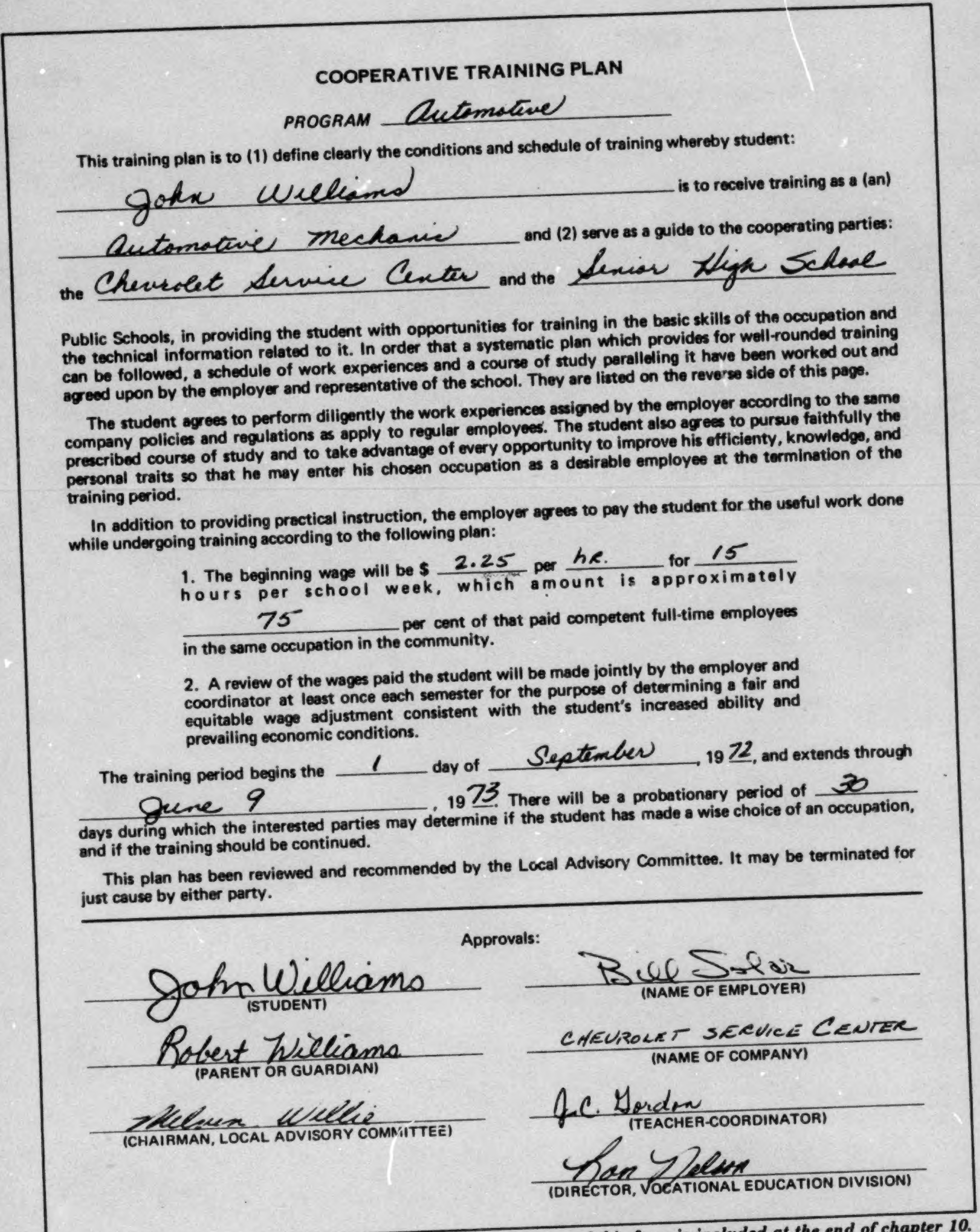
- ☐ Students must be of legal age to meet federal and state employment requirements, and meet established standards of basic automotive training.
- ☐ Students should be legally employed in occupations related to their in-school vocational instruction.
- ☐ Students should average as many hours per week on the job as they attend classes in school.
- ☐ Students should be placed in jobs on the basis of a training plan agreed to by the school, the employer, and the parents. A form suitable for a training plan is included in this section.
- ☐ Training plans should be individualized for each student, depending upon his individual needs and the requirements of the job for which he is being trained.
- ☐ The training plan should provide for employer and teacher-coordinator evaluation of student progress concerning activities specified in the plan.
- ☐ Students should be paid the same rate that beginning employees receive when they enter full-time work, with periodic increases as they progress.
- ☐ Students should be enrolled in this program as a result of guidance, counseling, and testing, and only with the approval of the cooperative vocational-education teacher.
- ☐ Student work schedules should follow an organized pattern designed to provide each student a variety of on-the-job experiences.
- ☐ Educational credit toward graduation should be granted to the student for his cooperative work experience.
- ☐ The program should be under supervision of a teacher-coordinator qualified in the automotive service field.
- ☐ The teacher-coordinator should be given ample time to visit the students at work, and to confer with employers regarding their progress. Another form suitable for recording the overall progress of a co-op student is included in this section. Student progress is also recorded on the training plan.

6.4 ORGANIZATION OF COOPERATIVE AUTOMOTIVE-SERVICE PROGRAMS

To be successful, a cooperative automotive-service program must be flexible and tailored to meet local requirements. Cooperative programs for students having employment objectives in the automotive service field may be structured in two basic ways. One approach is a "diversified" cooperative program and the other is a "specialized" automotive-service cooperative program. Many excellent examples of both types of programs are presently in operation throughout the United States.

The diversified cooperative program is suitable primarily for the small school which cannot support its own automotive shop facility. Students with varied occupational interests are grouped together in such a program for general vocational instruction applicable to all types of employment. The teacher-coordinator is responsible for developing specific training plans for each student in his area of occupational interest. A greater portion of specific job skill development is delegated to the employer in this type of program.

The other approach is identified with an existing in-school automotive curriculum for which cooperative training is used as a "capstone." In this approach, the specific job skill development is more equally divided between the school and the employer.



COOPERATIVE TRAINING PLAN

PROGRAM Automotive

This training plan is to (1) define clearly the conditions and schedule of training whereby student:

John Williams is to receive training as a (an)

Automotive Mechanic and (2) serve as a guide to the cooperating parties:

the Chevrolet Service Center and the Senior High School

Public Schools, in providing the student with opportunities for training in the basic skills of the occupation and the technical information related to it. In order that a systematic plan which provides for well-rounded training can be followed, a schedule of work experiences and a course of study paralleling it have been worked out and agreed upon by the employer and representative of the school. They are listed on the reverse side of this page.

The student agrees to perform diligently the work experiences assigned by the employer according to the same company policies and regulations as apply to regular employees. The student also agrees to pursue faithfully the prescribed course of study and to take advantage of every opportunity to improve his efficienty, knowledge, and personal traits so that he may enter his chosen occupation as a desirable employee at the termination of the training period.

In addition to providing practical instruction, the employer agrees to pay the student for the useful work done while undergoing training according to the following plan:

1. The beginning wage will be $ 2.25 per hr. for 15 hours per school week, which amount is approximately 75 per cent of that paid competent full-time employees in the same occupation in the community.
2. A review of the wages paid the student will be made jointly by the employer and coordinator at least once each semester for the purpose of determining a fair and equitable wage adjustment consistent with the student's increased ability and prevailing economic conditions.

The training period begins the 1 day of September, 1972, and extends through June 9, 1973. There will be a probationary period of 30 days during which the interested parties may determine if the student has made a wise choice of an occupation, and if the training should be continued.

This plan has been reviewed and recommended by the Local Advisory Committee. It may be terminated for just cause by either party.

Approvals:

John Williams
(STUDENT)

Bill Solar
(NAME OF EMPLOYER)

Robert Williams
(PARENT OR GUARDIAN)

CHEVROLET SERVICE CENTER
(NAME OF COMPANY)

Melvin Willis
(CHAIRMAN, LOCAL ADVISORY COMMITTEE)

J.C. Gordon
(TEACHER-COORDINATOR)

Ron Nelson
(DIRECTOR, VOCATIONAL EDUCATION DIVISION)

A blank copy of this form is included at the end of chapter 10.

COOPERATIVE TRAINING PLAN PROGRESS EVALUATION

Student's Name John Williams - Level II
Auto Service Station Mechanic I

Work Experiences Provided		Completed	Evaluation
Cooling & Heating	50	9-29-72	attitude average - needs practice use of hand tools - progress good
BRAKES	65	10-27-72	needs to study manuals before wk tends to understand directions
WHEELS & TIRES	50	11-22-72	Hand tool use better - has more confidence - could be good mechanic
STEERING & SUSPENSION	60	12-29-72	Understands geometry - Can read and use spec. - progress good.
DRIVE TRAIN	30	1-12-73	Can trouble shoot bearing and joints - interest high - good attitude
ENGINES	30	1-31-73	Understands basic wk - progressing very well - studies before wk.
ELECTRICAL	130	4-10-73	Able to perform jobs with use of manuals - needs more practice
FUEL-EXHAUST EMISSIONS	95	5-25-73	speed in performance has increased - knowledge very
MERCHANDISING	10		acceptable - should complete all wk by end of year
TOTAL	520 HRS		

Study Assignments	Record of Study
Ch 1 - ans even questions Ch 2 - ans. all questions	Comp 10/6 Test 85
Ch 18 - ans all questions - study Mfg. Manuals	Comp 10/31 Test 80
Ch 19 - ans all questions - study Mfg. Manuals	Comp 11/22 Test 95
Ch 3, 16, 17 - ans. all questions - study Mfg Manuals	Comp 12/22 Test 88
Ch 12, 13, 14, 15 Ans all questions - study Mfg Manuals	Comp 1/12 Test 82
Ch 1, 4, 5 Ans all questions - study Mfg. Manuals	Comp 2/2 Test 90
Chilton repair Manual	
Ch 7, 9, 10 ans. all questions study Sum.	Test 1 - 78
& Mfg Manuals	Test 2 - 90
	Comp 4/10 TEST 3-88
Ch 6, 11 answer all questions study	Test 1 - 95
Sum. and Mfg. Manuals	Comp. 5/25 TEST 2-90

- All asignments - Auto Mechanic - HGlenn - 2nd edition unless specified

- Equipment & tool manuals are included in Mfg. Manuals

A blank copy of this form is included at the end of chapter 10.

EMPLOYER'S REPORT TO THE SCHOOL

Student's Name John Williams Occupation Automotive Mechanic

Employer Chevrolet Service Center Date May 25 1973

Period: From May 1 1973 to May 25 1973

To the Employer: To better assist you in training the above named student so he or she will become a more valuable employee, we are asking that you fill in the form. Will you please place a check in one of the spaces to the right of each characteristic which best expresses your judgment of the student, and return this report to the coordinator of the program.

Work Record	Fair	Good	Very Good	Excellent
Quality of Work			✓	
Adaptability			✓	
Punctuality				✓
Dependability			✓	
Appearance		✓		
Attitude Toward Fellow Workers			✓	
Attitude Toward Job			✓	

Individual Comment: Student is in need of a haircut. We are now supplying him with shop uniforms. John is still progressing smoothly and is now a profit to our company.

Signature of Employer Bill Solar

Will you please write on the lines above some comment about the student whose name appears at the top of this sheet? Also if you have any suggestions as to what the school can do to increase the competencies of the student as an employee, it will be very welcome. We at the school are anxious to cooperate.

Thank you very much,
Coordinator Occupational Training

A blank copy of this form is included at the end of chapter 10.

This program is usually restricted to eleventh and twelfth grade students who have had one or two years of shop subjects in the automotive curriculum prior to entering cooperative training.

Student entrance into either type of cooperative program should result from guidance, counseling, and testing. In all cases, a training plan for each student should be developed jointly by the coordinator, the employer, and the student's immediate employment supervisor. The plan should show the work experiences desired for the student through part-time employment, as well as the technical and general materials to be studied in school.

A student's work schedule may be arranged in different ways. For example, he might work three hours each day; work alternate weeks with another student; or work during alternate school quarters or semesters. All of the standards for cooperative vocational-education programs suggested in Section 6.3 should be met in both types of programs.

6.5 ESTABLISHING A COOPERATIVE AUTOMOTIVE-SERVICE PROGRAM

In order to initiate a cooperative automotive-service program, plan it as a long-range operation according to the following guidelines:

1. Obtain approval of the program from the proper school authorities in your area.
2. Approach the advisory committee of the local automotive service industry, and submit the proposed program in detail, stressing all benefits in order to enlist the committee's cooperation. If such a committee does not exist, approach the local dealer organization or the individual dealers regarding the program.
3. Make sure the program is planned so that it is in line with the suggested standards outlined in Section 6.3.

6.6 SUMMARY

The real measure of success for a cooperative vocational-education program is whether or not a graduate gets—and retains—a job commensurate with his skills and knowledge. The strength of the partnership created between the school and the employer is a key factor contributing to the degree of success achieved in the program. Each member of the partnership—student, teacher-coordinator, employer, and parent—has his special role to play in the cooperative endeavor. In a cooperative program, all parties must recognize the necessity for loyalty and responsibility to each other. The teacher-coordinator has the responsibility for developing and maintaining the necessary cooperative relationship within the partnership.

If more detailed information is desired concerning cooperative vocational-education, write the following sources: State Director of Vocational Education; State Department of Public Instruction; the U.S. Office of Education.

SECTION 7

PROGRAM EVALUATION

7.I INTRODUCTION

Program evaluation is an ongoing process of measuring or assessing effectiveness. Evaluation output can be used to offer directions for program operation and modification.

The automotive service program will be judged in light of how well it meets its stated objectives and how well these objectives fit the needs of the students being served. The objectives for the automotive service program will grow out of the requirements of the service trade and the interests and abilities of students.

All those concerned with the evaluative process must understand that evaluation is not a judgment of individuals; it is solely concerned with program ***modification*** and ***improvement.*** It is a value judgment of the efficiency of the program and its goals, and a determination of whether those goals are being met. It should not be considered as an individual rating system and should only be used to improve the total program.

7.2 BENEFITS OF EVALUATION

There are several reasons why a vocational program should be subjected to frequent evaluation procedures. They compel the vocational administrator and his staff to define clearly the program goals and to review these periodically. All evaluation, if it is sound, is based upon the specific goals accepted by those conducting the program. This can become a valuable professional learning experience for staff members. It also develops a readiness on the part of the staff to make the changes and improvements suggested by the evaluation process.

7.3 ELEMENTS OF GOOD EVALUATION

To be useful, evaluation should involve the cooperation of all participants in the program—staff, students, parents, employers, labor officials, guidance personnel, and representatives from related public agencies. It should be comprehensive in its effort to measure the degree to which all of the program goals are being reached. It is also necessary to know how well vocational education is serving the needs of all those who can benefit from it. Evaluation should concentrate upon progress being made, and not limit itself to comparisons with other programs or with presumed norms. Further, it should deal with both long- and short-term goals. Some aspects of a program can show improvement in a short period of time, while others might require study over a period of years in order to judge effectiveness.

It is suggested that a three-step approach be designed for the evaluative process:

1. An in-depth, self-evaluation study;
2. An on-site verification or audit by a team of qualified automotive service personnel;
3. A review by a third group, based on evidence in the self-evaluation report and on-site audit; this group might be composed of service managers.

The self-evaluation study should provide staff members with a systematic means of analyzing the program and allow them to gain fresh insight into the various resources open to them.

The visiting team might be made up of servicemen actually engaged in the automotive service trade. They would give a true picture of actual conditions and operations.

The third group should aid in comparing the results of the first two groups in order to resolve any differences between them. The third group could suggest which recommendations of the first two groups would best serve to improve the program.

7.4 ITEMS TO BE CONSIDERED IN EVALUATION

Numerous factors influence the capacity of a program to meet its goals, and each can be studied in appropriate ways to estimate its effectiveness. Among the items to be considered for evaluation are:

1. Measurable performance objectives of the program;
2. Achievement of those objectives (Indicators of Success);
3. Organization and management;
4. Curriculum;
5. Learning resources;
6. Supplies and equipment;
7. Instructional space and facilities;
8. Use of occupational advisory committee;
9. Student personnel services:
    a. Recruitment and admission;
    b. Guidance and counseling;
    c. Placement and follow-up;
10. The teaching-learning process.

This is not an exhaustive list, but it is sufficient to suggest some of the program dimensions which need to be examined when program quality is being measured.

7.5 TECHNIQUES FOR CONDUCTING EVALUATION

Several methods can be used to appraise the elements of the auto service program selected for study. The means for securing information should be appropriate to the nature of the information sought. Among the methods and instruments which can be used for either self- or outside-evaluation are the following:

1. Structured interviews—using carefully prepared guide sheets—with teachers, administrators, students, parents, counselors, employers, union officials, members of school boards, advisory committee members, and officials of community agencies;
2. Questionnaires sent to some or all of these individuals;
3. Examination of records relating to those program areas for which records are available;
4. Review of written courses of study and other evidence of curriculum content;
5. Observation and inspection of facilities, equipment, supplies, and teaching aids and materials;
6. Observation of instructional practices, with the use of carefully constructed checklists.

In using any of these data-gathering devices, it is well to prepare a detailed checklist in advance for each aspect of the program to be studied. Members of the vocational staff should share in the development of these checklists, which they or other evaluators will then put to use. A good plan is to require the evaluator to rate each item on a checklist, using one of the following code designations:

M — Major improvement needed; some serious weakness;

I — Improvement needed; no crucial weakness;

S — Satisfactory; adequate;

E — Excellent; very well done;

NA — Not applicable.

Local administrators would be well advised to seek the advice and help of the vocational officials in their State Department of Education when planning for program evaluation. Since most administrators do not have the resources to develop their own evaluation procedures and instruments, it is recommended that an instrument already developed be used. The American Vocational Association, under a grant from the U. S. Office of Education, has developed such a publication: ***Instruments and Procedures for the Evaluation of Vocational/Technical Education, Institutions and Programs.***

7.6 REPORTING EVALUATION RESULTS

The evaluation process has little value unless the findings are made known to those able to take the steps necessary to improve the program. This means that a clear, factual report of the findings and recommendations should be prepared and shared with board of education members, the superintendent or school president, the staff, employers, union officials, members of advisory committees, and the community at large.

Reporting the results of an evaluation can be done informally by conducting briefing sessions with staff members and other groups, where findings can be presented and discussed. This should be followed by a distribution of the formal, written report.

SECTION 8

TEACHER RECRUITMENT AND EDUCATION

8.1 INTRODUCTION

The recruitment of potential automotive instructors should be a continuous activity of school administrators, coordinators, counselors, teachers of vocational subjects, teacher educators, and automotive industry supervisors.

Teachers in automotive subjects at the secondary and post-secondary level should have an interest in students who might develop into excellent instructors. These young people will be students with intense interest in the subject. They will have above average manipulative skills. They should possess skills in the area of communication, i.e., speaking and writing. They should have the ability to complete the Bachelor of Science degree and to participate in "on-the-line" work in the automotive service field. Most of all they should exhibit an intellect, temperament, and personality adaptable to teaching in both shop and classroom. Qualified students enrolled in post-high school programs should be encouraged to consider teaching as a career. The community college occupational-program should be considered an excellent source for teachers of automotive occupations. Universities are now accepting credit from these programs toward the bachelor's degree. Students interested in following this route to a teaching degree should ask their school counselor for a list of possible colleges and universities to contact.

Another source of potential teachers is the automotive-service industry itself. Likely candidates may be identified by shop supervisors, service managers, manufacturing service representatives, and others. They will have demonstrated their ability to train helpers or explain the solutions to mechanical problems to others.

8.2 RECRUITING

A major problem when recruiting in this field is how to expose individuals with the right background to teaching *without* jeopardizing their present employment. Two solutions to this problem are suggested. The most desirable solution would be to arrange for a leave of absence from regular employment to permit the completion of a specific teaching assignment on a trail basis for one semester. A second solution would be a teaching assignment on a part-time basis with adults in an evening program, an assignment which would not interfere with the person's full-time employment. Following either of the two experiences, the individual will usually be in a better position to make a sound decision as to whether or not he should enter teaching. The recruitment process could be facilitated through student stipends. Stipends for promising community college graduates would provide needed incentive for continuing education—particularly for underprivileged students. Employers should also be encouraged to develop scholarship funds for persons desiring to enter vocational automotive service instruction.

8.3 TEACHER CERTIFICATION

Teachers recruited from the trade must meet certification requirements for vocational teaching. The formal requirements include general education at the college level, development of teaching knowledge and skills, and the study of automotive technology. Work experience requirements are less specific, but generally require at least as much time as that devoted to academic training.

College graduates who wish to teach vocational automotive classes must complete an appropriate amount of work experience before they are qualified to teach. This work experience may be earned before college entrance, while attending college, after graduation, or by combining any of these. College graduates who do not qualify can make up this work-experience deficiency by devoting vacation periods to selected work experience.

Information on certification requirements can be obtained by writing to the State Director of Vocational Education.

Detailed information on curriculum, transfer of credit, and specialty courses may be obtained by writing directly to institutions offering such programs.

8.4 COOPERATIVE WORK STUDY COLLEGE PROGRAMS

A number of college programs incorporate work experience as a necessary part of their undergraduate programs. The periods of work experience may be for a summer, a semester, or an entire calendar year. In some programs, a small amount of college credit is awarded.

8.5 WORKSHOPS AND INSTITUTES

The automotive industries schedule one- and two-week technical workshops or institutes for instructors during vacation periods. The technical knowledge and skills taught in these institutes may include such areas as wheel alignment, air conditioning, and transmissions; generally they are based on a survey of instructor needs. Attendance at these institutes is highly recommended as the topics covered and the information presented is up-to-date. Some colleges and universities (about 60) will award college credit to the persons completing an institute—usually one semester credit for each week of attendance.

The following motor vehicle manufacturers conduct training and workshop programs for instructors. Those interested in attending a workshop or institute are urged to address a letter to:

Chrysler Corporation
26001 Lawrence Avenue
Center Line, Michigan 48015
c/o Manager, Service Development
and Training

General Motors Corporation
Service Section
General Motors Building
Detroit, Michigan 48202
c/o Manager, Product Education
and Training

American Motors Corporation
14250 Plymouth Road
Detroit, Michigan 48232
c/o Service Training Manager

Ford Motor Company
Garrison Place East
19855 Outer Drive
Dearborn, Michigan 48124
c/o Manager, Service Program
Development Department

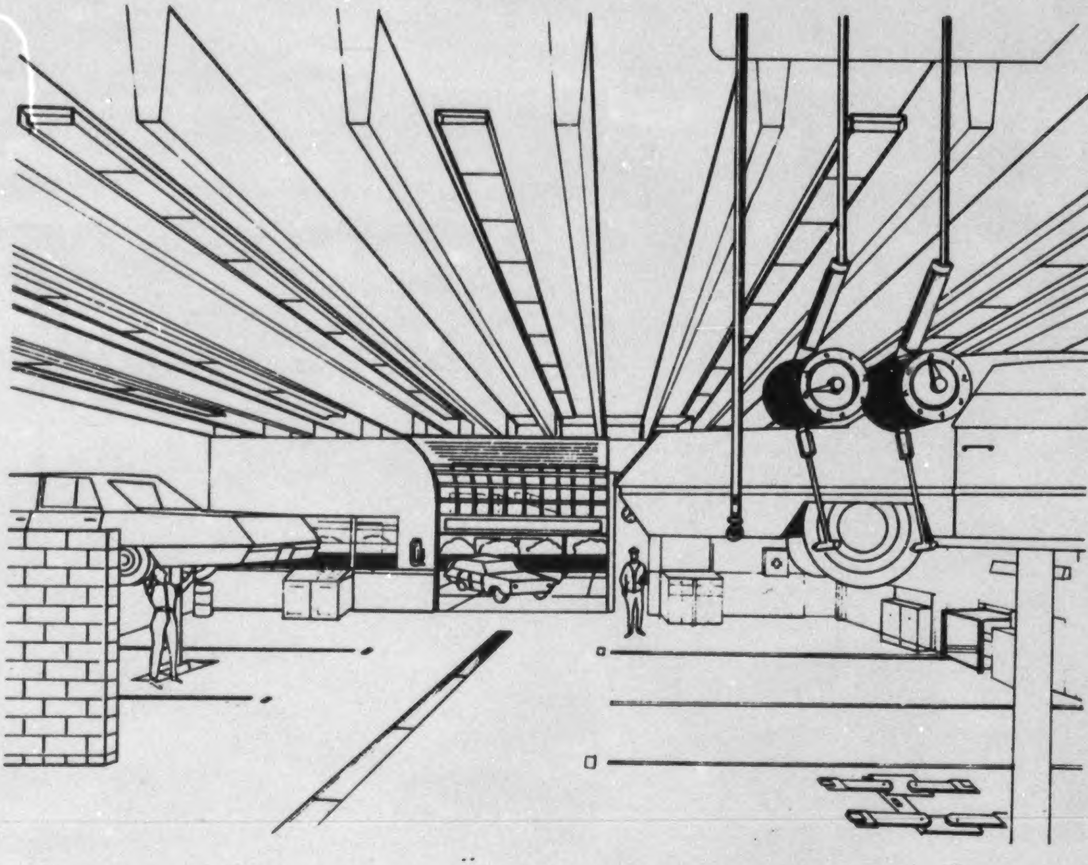
International Harvester Company
Truck Division
401 North Michigan Avenue
Chicago, Illinois 60611
c/o Manager, Service Development

White Motor Corporation
White Truck Division
P. O. Box 5757
Cleveland, Ohio 44104
c/o Manager, Service Training

Many component and test equipment manufacturers also conduct organized training programs. Information on these schools concerning their respective courses of instruction may be obtained from individual firms.

SECTION 9

FACILITIES



9.1 INTRODUCTION

One of the most serious problems facing many schools today is the need for "adequate facilities"—facilities not only adequate for today's instructional needs but also flexible enough to provide for tomorrow in terms of advanced technology in the automotive service industry.

A well-designed facility tailored to the needs of an adequate automotive-service curriculum is one of the most important factors in the successful operation of an automotive service program. The appearance of an automotive school laboratory should approach or parallel the appearance of an automotive dealership. This, in turn, is suggestive of its capabilities and also materially adds to the "image" of the automotive service technology program.

The purpose of this Section is to assist school administrators and architects in effectively determining and economically planning their facility needs. This guide contains basic criteria for planning automotive instructional areas. It is based upon information assembled from the practice, experience, and success of motor vehicle dealers and accepted principles outlined by various organizations serving the automotive industry.

In planning adequate facilities, one of the more critical considerations—and one that is often underestimated—is providing adequate space to meet changing needs as change affects the automotive service industry. Providing just the "minimum" space may appear attractive and adequate today, but it often turns out to be a short-lived compromise and an expensive decision.

It is therefore necessary in planning to remember that the physical capability of the automotive service facility should not be considered in static terms, but in terms of flexible growing potentials. Buildings should be constructed for future expansion. Lot areas should be carefully considered in the light of future building expansion and additional parking and storage needs.

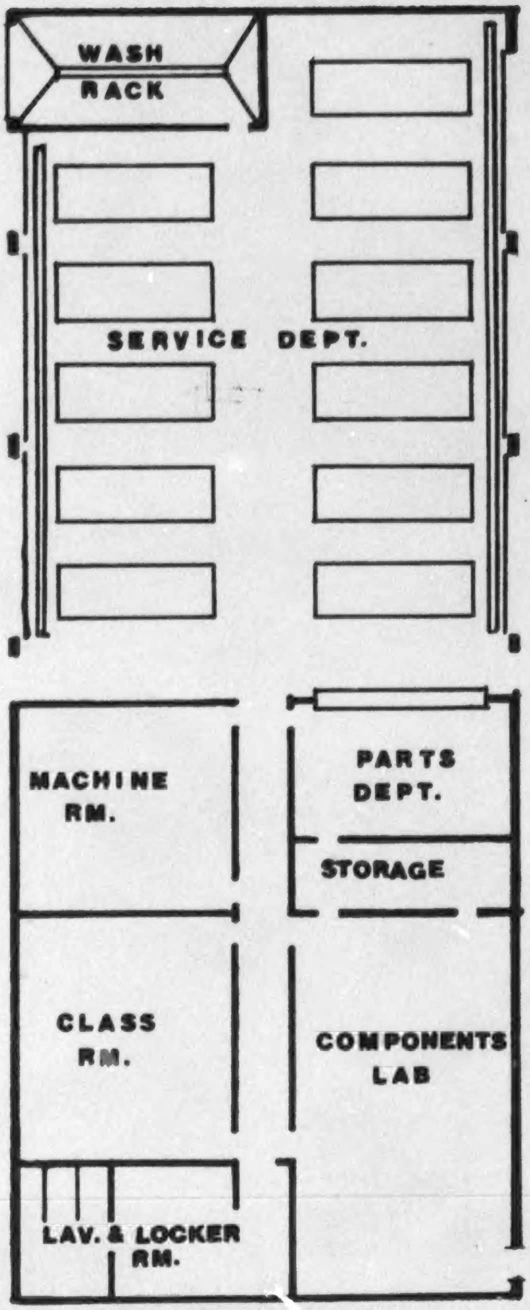
It should be remembered that future expansion may be prohibitively expensive or otherwise impractical if not considered in the original planning state.

9.2 SITE LOCATION

The most important decision in automotive service facility planning is the selection of the right site. Frequently, this decision is too hastily made and too often related to the architectural and aesthetic appearance of other buildings.

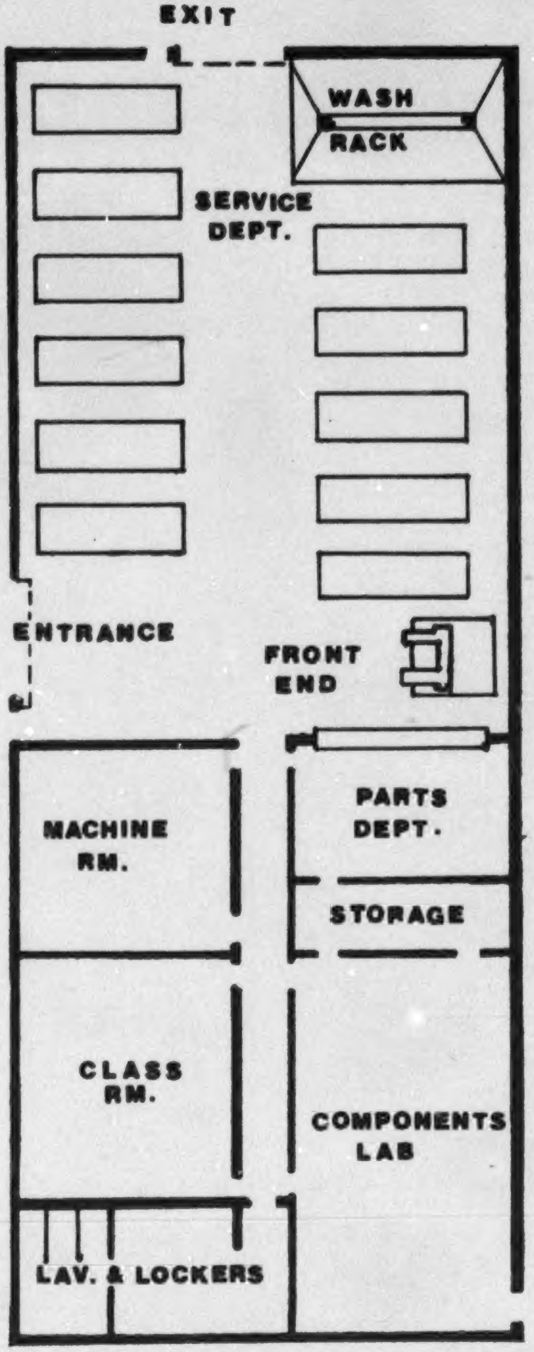
The ideal would be a wide, level, rectangular lot which is easily accessible and which is located in such a position that adequate parking facilities are also available.

Zoning regulations should be carefully investigated to be certain that local building codes permit the construction of automotive facilities near schools, residences, thoroughfares, public occupancy buildings, and other pertinent locations.



A Sample Shop Floor Plan

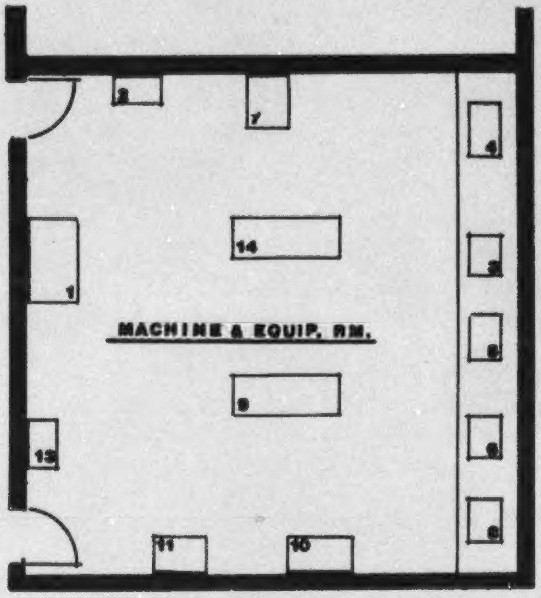
The site selected should allow for future growth and expansion with minor difficulty and expense.



Off-street parking space should be provided. This area should allow parking space for not less than half the capacity of the shop, and preferably the full capacity. This will provide a place for parking completed projects, which is essential if the shop is small and if floor space is needed for work stations. A 10-foot fence with a locking gate should be erected around the parking space, with adequate outside lighting in the parking area.

9.3 SERVICE DEPARTMENT

The automotive service laboratory or "shop" should resemble the modern facilities used in the automotive service industry. If it does, it will become a "salesroom" for service and should be treated as such. The "image" of the school, and in turn the industry, will be greatly enhanced if school facilities are in keeping with standards established by the automotive industry.



Left: A Sample Shop Floor Plan.
Above: A Sample Machine and Equipment Room Floor Plan.

9.4 STALL ARRANGEMENT

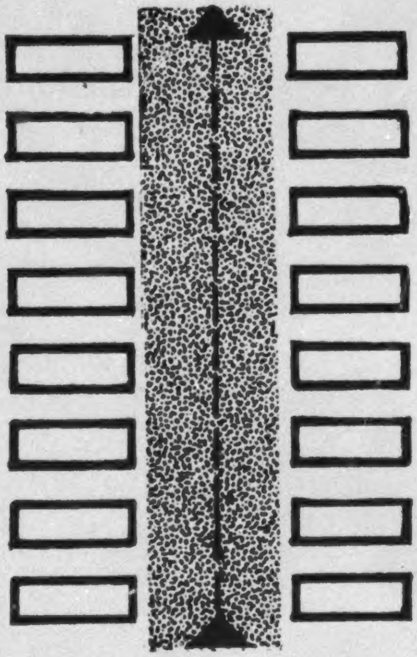
The arrangement of stalls and specialized equipment depends upon the general shape of the facilities, the number of specialized areas—such as wheel alignment—and to some extent the preference of instructors. However, a few fundamentals should be kept in mind: convenient location of entrances and exits, easy access to service stalls, a parts and tool room and counter convenient to lubrication, and "quick service" stalls. Maximum use of space will result when one access aisle serves two rows of productive stalls.

9.5 TRAFFIC FLOW

The layout of a service facility for automotive service programs should be planned so that entrances and exits permit one-way traffic flow. The arrangement of stalls to obtain an efficient traffic pattern that makes maximum use of space is one of the most critical factors in planning an efficient automotive service laboratory.

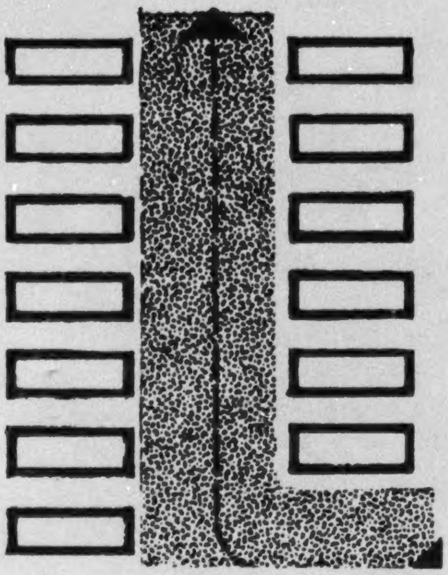
9.6 STALL PATTERNS

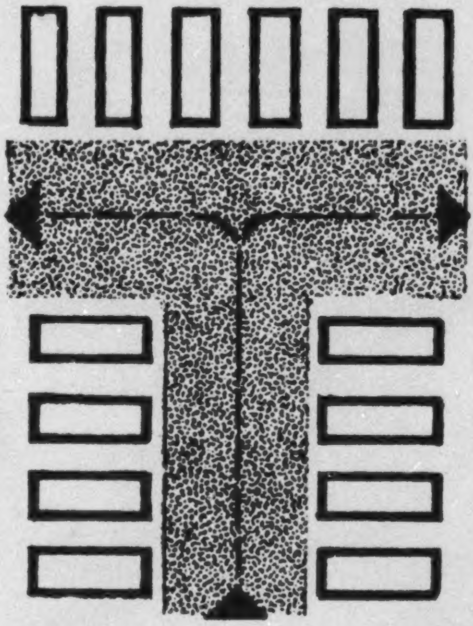
The type of stall arrangement chosen may be dictated by land limitations. For example, a narrow plot might be most suitably served by the I-Type design; a square plot of land, particularly in a larger school, might be more favorably served by the U-Type design.



I-Pattern

As shown in the illustrations, a simple "I" pattern is the most efficient. This will work in most schools if the site permits such an arrangement. However, it cannot be considered a "cure-all." If the number of stalls needed results in an excessive overall





Left: The "I" Stall Pattern.

Top Right: The "L" Stall Pattern.

Above: The "T" Stall Pattern.

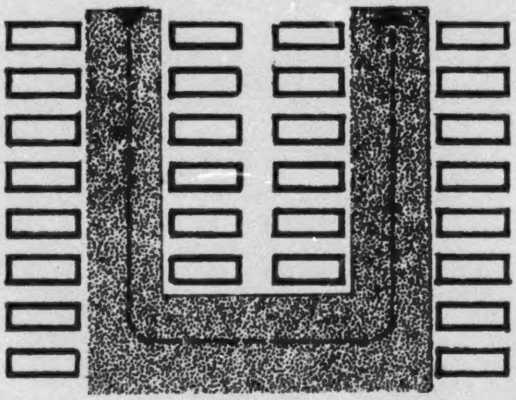
length, it makes supervision difficult and places many stalls too remote from the parts and tool crib.

L-Pattern

The "L" pattern is the second most efficient stall and aisle arrangement. It is normally used in those instances where straight-through traffic is not possible. Note: it is necessary to sacrifice two stalls in order to accommodate one of the entrances.

T-Pattern

The "T" pattern permits the same number of stalls as the "L" pattern. However, the "L" pattern makes car movement difficult into the two end stalls near each exit. This stall and aisle pattern is useful in cases where an exit in the rear wall is impossible and the location of an alley makes two side exits more practical.



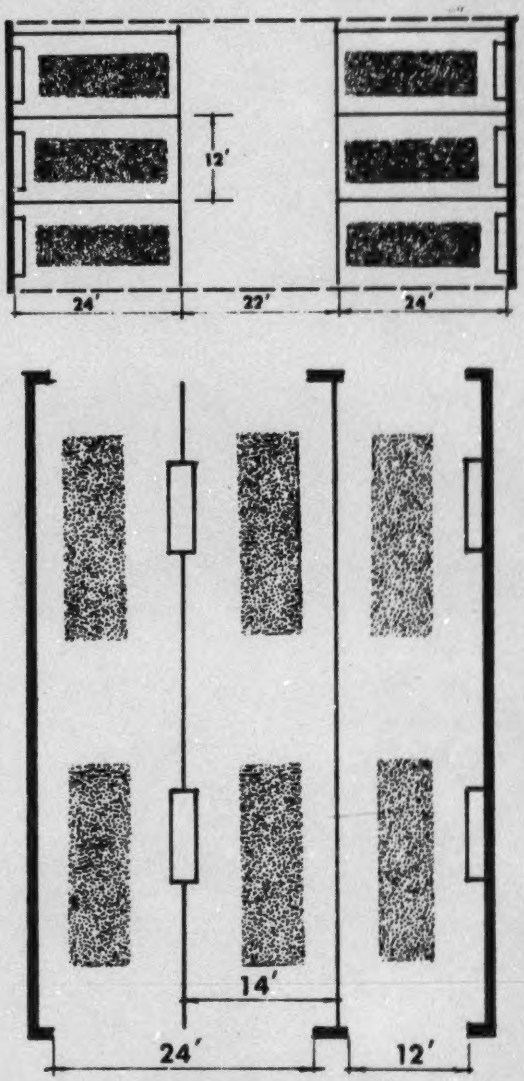
The "U" Stall Pattern.

U-Pattern

The "U" pattern may be used in large training facilities or where no other arrangement is permissible because of neighboring structures or public streets. The "U" tends to centralize service traffic for more efficient control and accessibility.

9.7 STALL DIMENSIONS

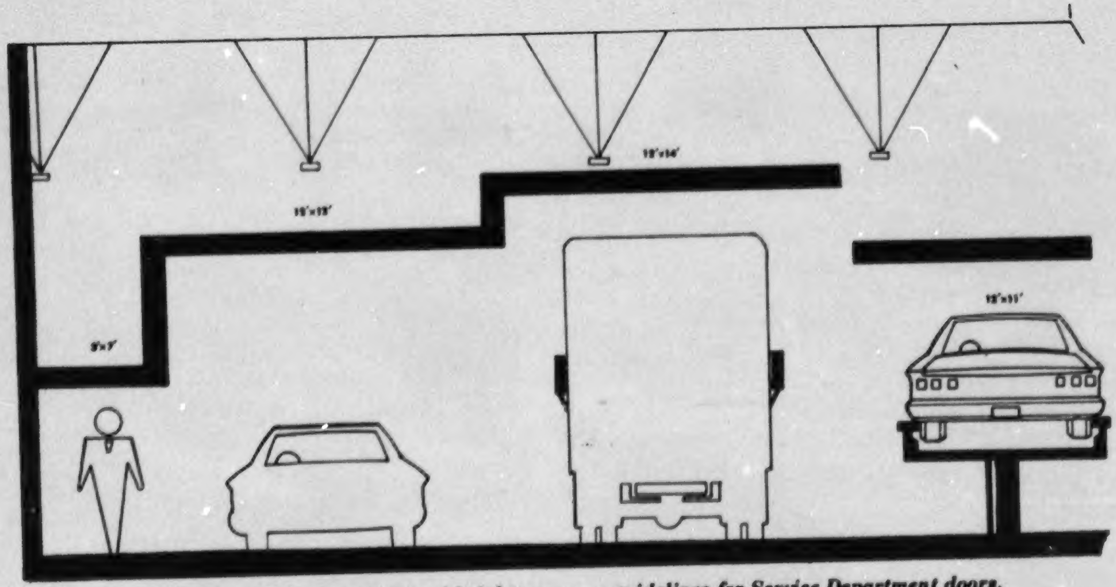
The width of stalls must include "car width" plus working space on each side of the vehicle. The total width varies from 10 feet to 15 feet according to stall function. When a stall is next to a wall, add 2 feet to the width. Local building or fire codes supersede these recommendations if they conflict.



Top: 90 Degree Stalls.
Above: Drive In Work Stalls.

9.8 STALL ANGLE AND AISLE WIDTH

Stalls at 90-degrees provide the most efficient layout and are recommended whenever circumstances permit. The ideal width for aisles leading into 90-degree stalls is 22 feet (total inside building width,



The above minimum widths and heights serve as guidelines for Service Department doors.

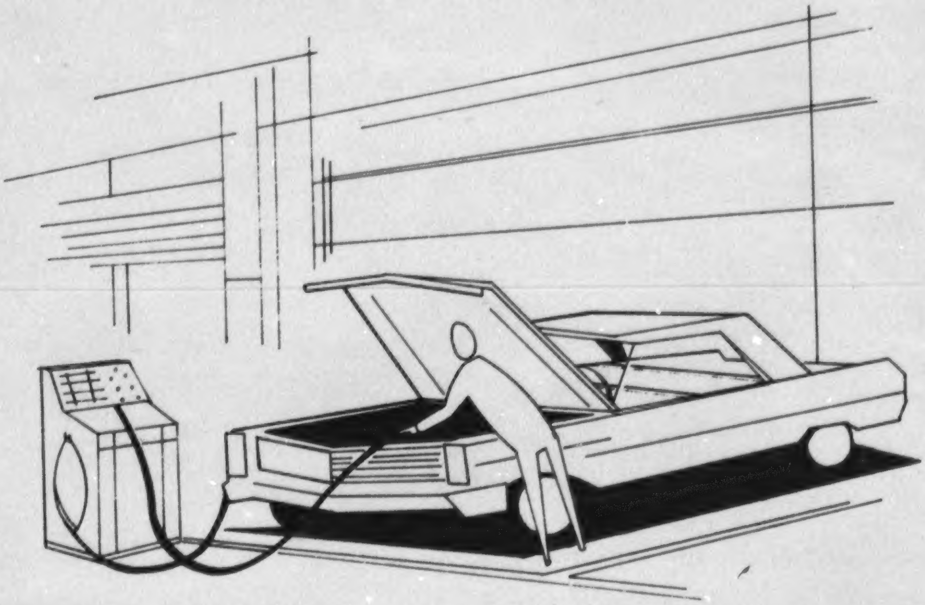
70 feet). For best utilization of space, one aisle should serve two rows of stalls.

9.9 STALLS AT 60-DEGREES OR 45-DEGREES

Stalls at 60-degrees or 45-degrees are not recommended when 90-degree stalls are possible. Not only is space wasted, but traffic movement is basically in one direction only. Where 60-degree stalls must be used, 18-foot aisle widths are recommended; 45-degree stalls require a minimum of 16-foot aisles.

9.10 DIRECT DRIVE-IN STALLS

In individual stall buildings, stalls should be 12 feet x 30 feet (30-foot width of building) with 10-foot single doors or 20-foot



A Minor Repair Stall.

double doors. If a drive-through, 60-foot building is utilized, the stalls should be 14 feet x 30 feet, with 12-foot single doors or 24-foot double doors.

9.11 HEIGHTS OVER SERVICE AREAS

Overhead clearance in the service area must be at least 12 feet 6 inches (14 feet for commercial stalls) in order to provide room for lifts. Additional clearance is necessary for overhead lighting fixtures, heating, and plumbing. Production and parking areas, where the car does not have to be raised, can be as low as 8 feet 6 inches. Caution should be observed that tracks for roll-up doors are mounted high enough to allow clearance between the opened door and opened hoods of cars on a raised hoist. See drawing for specific details.

9.12 SERVICE STALLS

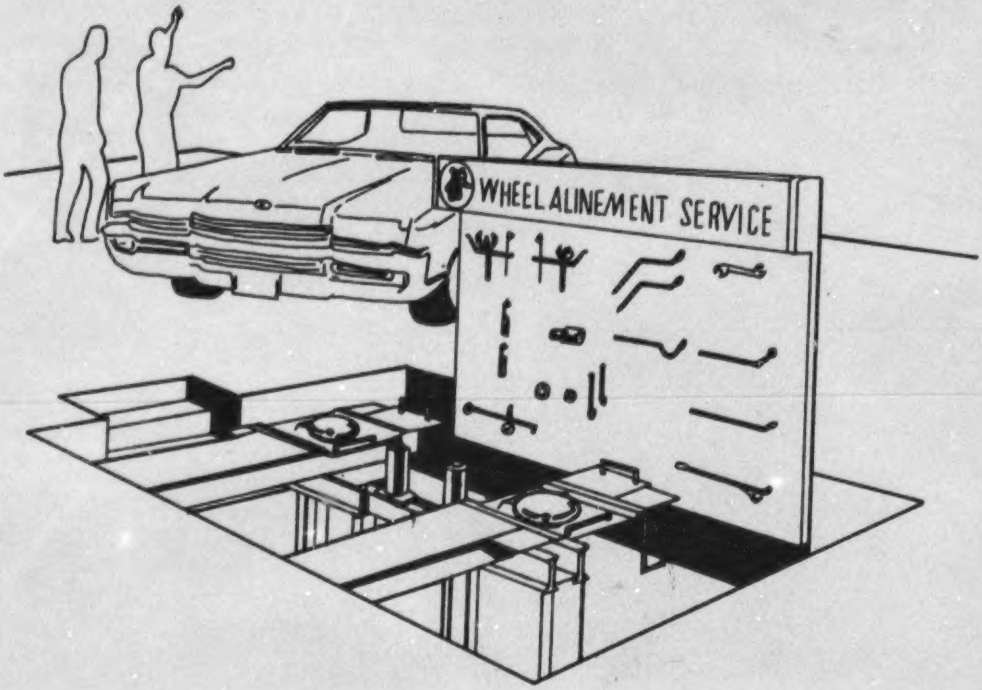
The general-purpose labor stall can be used for a wide variety of service. Each stall should be provided with, or have immediate access to, compressed air, 110-volt electrical outlets, an exhaust system, and water. Equipment required: work bench, vehicle lift (one for each three stalls), and waste receptacle.

9.13 MINOR REPAIR AND QUICK SERVICE STALLS

The equipment used in electrical tests and engine tune-up stalls for this service work should be easily accessible. In addition, traffic flow in and out of minor and quick repair stalls is quite frequent. Placing these stalls near the entrance helps reduce internal traffic problems and car handling.

9.14 MAJOR REPAIR SERVICE STALLS

Major repair stalls should be located toward the rear of the shop near the tool room. Since traffic movement in and out of these stalls is less frequent, the exact location should be determined accordingly.



9.15 PITS

Pits for wheel alignment are governed by local codes. In some localities, certain pits are illegal, so local codes should be checked for restrictions. Pits also require adequate drainage, lighting, and, on occasion, such special devices as frame straightening and front-end alignment equipment. Pits are permanent structures; their locations should be planned carefully to avoid restricting flexibility of future expansion of the layout.

9.16 WASH RACK

This is a necessity, but should be placed in a secondary, easily accessible location.

9.17 AIR AND COMPRESSOR EQUIPMENT

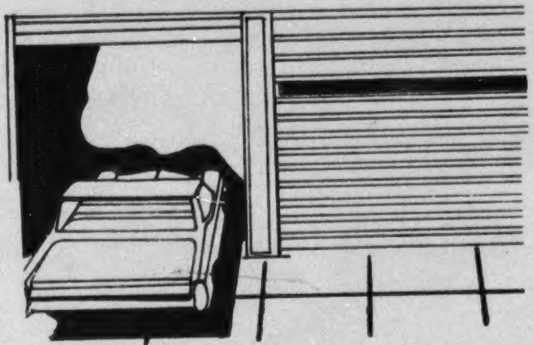
Shop requirements, number of lifts, power tools, individual air outlets and similar items determine needed compressor capacity. Once requirements are determined, it is better to provide two compressors in tandem. (e.g., two 5-H.P. units rather than one 10-H.P. unit) to give protection in case of a breakdown. It is preferable to locate the compressor in the mechanical room of the building or other area outside the automotive laboratory facility.

9.18 DRAINS

An open-trench drain with standard grating, catch basin, and inlet for flushing is very effective. Where possible, the drain should extend the entire length of the service department. At a point 4 feet out from each side wall, the floor should pitch approximately 1 1/4 percent to the center of the drain trough, or 1 1/2 inches per 10 feet of horizontal distance. This system can quickly dispose of mud, snow, and water dropped by incoming vehicles. The open-trench drain should be connected to a "sand trap" or "clarifier" to trap all solids. For reasons of economy, the drain system should be designed to utilize the same trap for both the trench drain and the wash rack. Naturally, the local plumbing and building codes will supersede any of these suggestions. See drawing for details.

9.19 ELECTRICAL POWER SYSTEM

Electrical outlets should be provided for each stall, the machine area, tool room, and other strategic locations. Certain shop equipment, such as an arc welder, requires 220 volts—a factor to consider when planning. All electrical outlets in the service department should be at least 3 feet above the floor. Gasoline fumes can accumulate below this level and cause an explosion hazard. A significant savings in electrical costs can be realized if all lights and outlets are controlled by master panels instead of individual toggle switches. Also, night lights should be provided for security purposes and to illuminate switch panels. Make certain of the availability of adequate electrical power when considering a new building or location.



See page 39 for more door height details.

9.20 DOORS

The service entrance door for incoming vehicles should be 16-feet wide and 12-feet high. A two-lane traffic door should have a minimum width of 24 feet. Minimum width of a single drive-thru reception stall should be 14 feet. A single service exit door should be 14-feet wide and 12-feet high. Doors should be electrically operated whenever possible.

9.21 HEATING SYSTEM

A system of overhead gas or oil space heaters and blowers, with thermostatic controls for individual operation, is usually the most economical for service departments. Such a system provides immediate heat to counteract cold blasts from open service doors. Since the heating units operate independently of each other, there is usually sufficient heat for operation of the service department if one or two of the units should break down.

Hot water or steam unit heaters are the next best choice. Check local plumbing and building codes for equipment and utility requirements. In addition, air curtain service entrance doors have been found especially effective in large facilities where entrance door traffic is heavy or weather is inclement.

9.22 FLOORS

The service department floor should be given special attention since it receives more wear and abuse than any other part of the building. It must resist oil, grease, and water, and be dust free. The hard finish desirable on a service floor can be obtained by using reinforced concrete with a hardening agent and a steel trowel finish.

While the installation of a service floor with these desirable hard finish qualities will be more expensive originally, it will prove to be an economical investment in the long run. Floors not finished in this manner require the application of a special sealer at the time of installation, and must be periodically resealed to keep them impervious to grease and oils.

It should be understood that there is no floor sealer on the market that performs satisfactorily on concrete that is not structurally sound. For concrete-floor installation, employ the best contractor available.

9.23 FRONT-END SERVICE

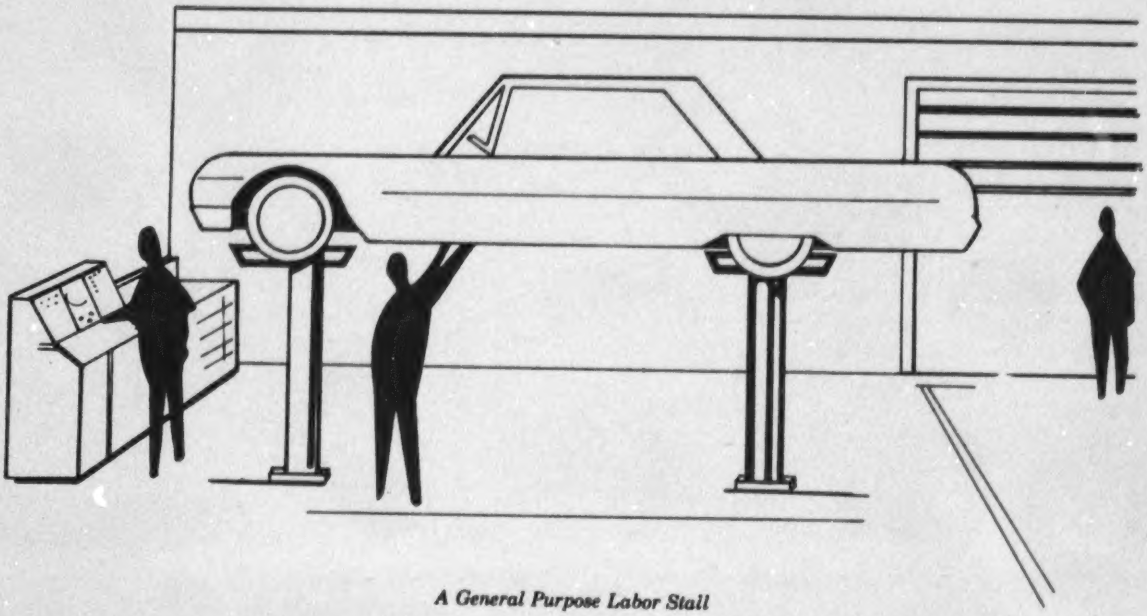
The choice of front-end service equipment will depend upon the space available, its location in the building, and expected use.

9.24 LAVATORY FACILITIES

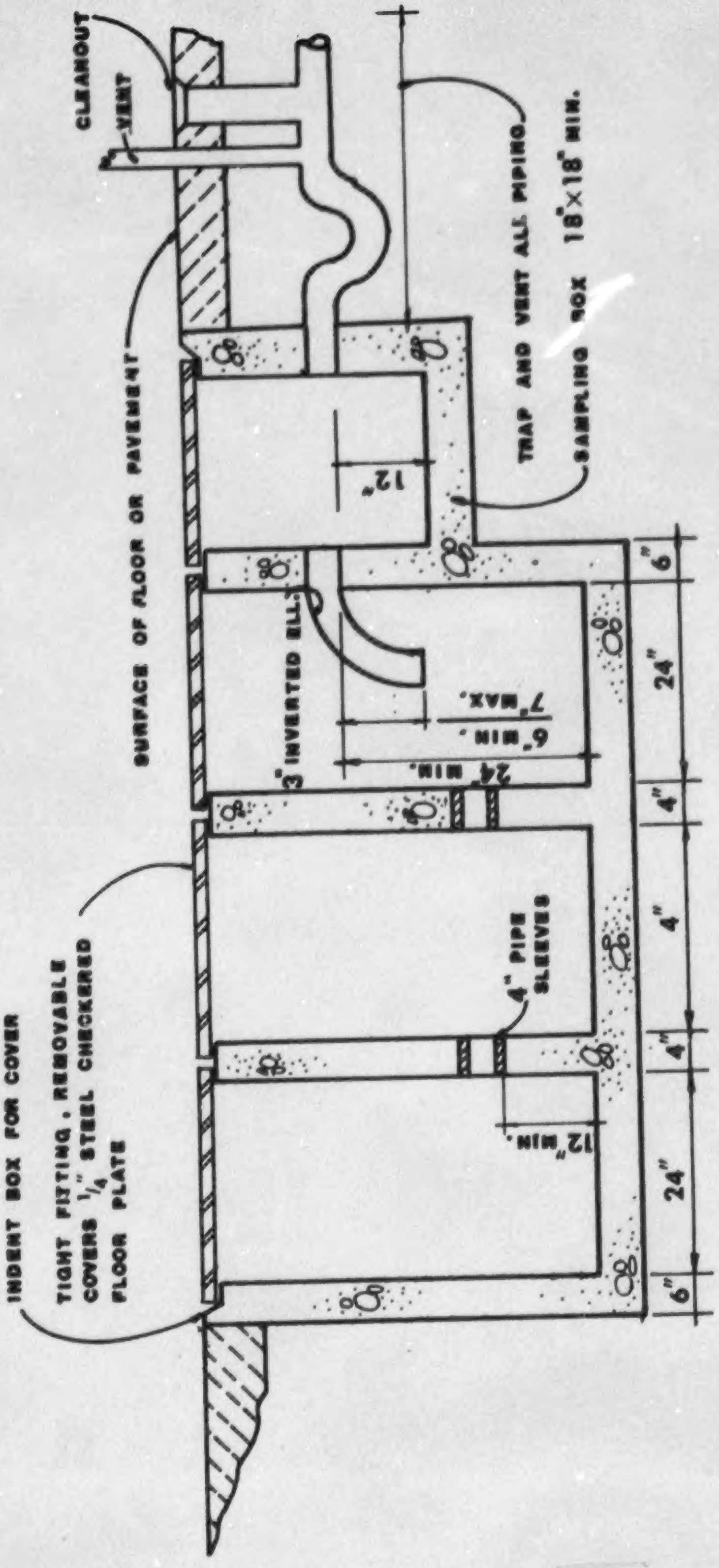
Minimum requirements are determined by local building and plumbing codes; however, the goal should be adequate accommodations. For economy, all plumbing facilities should be grouped whenever possible.

9.25 LIFTS

Large production shops utilize one lift for every two mechanical production stalls.



A General Purpose Labor Stall

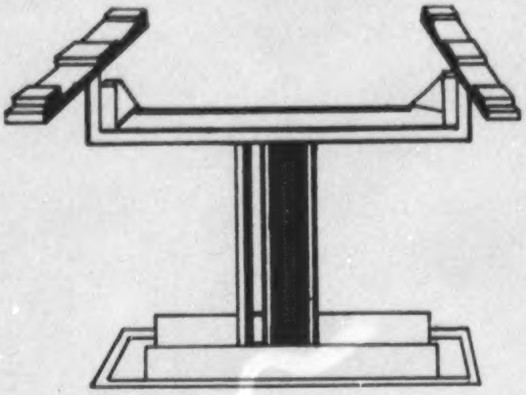

INDENT BOX FOR COVER
TIGHT FITTING, REMOVABLE COVERS 1/4" STEEL CHECKERED FLOOR PLATE
4" PIPE SLEEVES
12" MIN.
24" MIN.
6" MIN.
7" MAX.
3" INVERTED ELL
SURFACE OF FLOOR OR PAVEMENT
12"
CLEANOUT
VENT
TRAP AND VENT ALL PIPING
SAMPLING BOX 18"×18" MIN.
6"
24"
4"
4"
4"
24"
6"

Drainage System Cross-Section

Not only are a sufficient number of lifts an economic necessity, but it is equally important to have them located where they do not restrict traffic flow, and far enough apart to provide adequate working space. They should be arranged within the service area to obtain maximum flexibility. The preferred type of hoist for lifting cars is one that engages the front suspension and rear axle, or all four wheels.

The type and volume of live work performed by the students affects the number and type of lifts you need. On an average, one hoist for every two stalls is the minimum requirement. Careful planning to determine the correct number and locations of lifts before starting to build is essential.

Following are illustrations of the three most popular lifts and uses of each type.

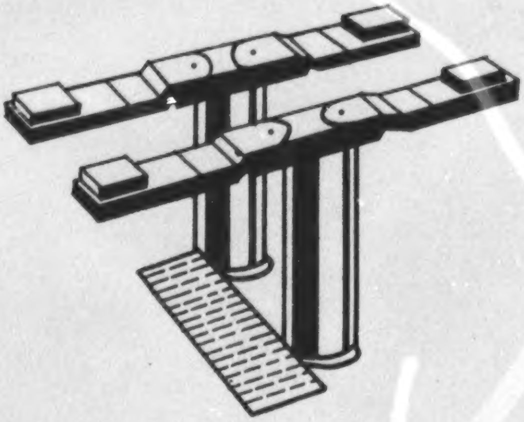


Type:
Single-Post Drive-thru Frame Contact Lift.

Uses:
Wheels, tires, brakes, oil changes. Some underbody mechanical, muffler, transmission and drive line work can be done. For use with cars and light trucks only.

Capacity:
8,000 pounds.

Evaluation:
Four positioning pads are required. Economically priced, this type lift permits full accessibility to underbody parts.

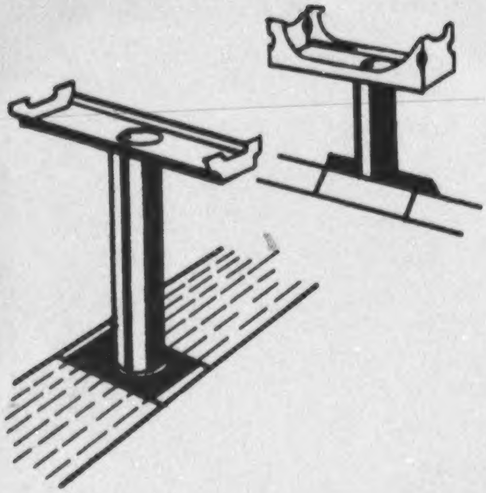


Type:
Single-Post Swing Arm

Uses:
Some underbody work, but especially adaptable to wheel, suspension and lower body work. For use with all cars and light trucks.

Capacity:
8,000 pounds.

Evaluation:
Probably one of the least expensive lifts to install and maintain. But it does not offer the versatility of other lifts described here. Care must be taken in centering load on lift post.



Type:
Two Post Movable Front Post Axle-Contact Lift

Uses:
Same uses as Single-Post Drive-thru Hoist but has clearer accessibility to underbody. For use with cars and light trucks. Larger model of this type lift is available for use with heavier trucks.

Capacity:
11,000 pounds.

Evaluation:
Higher priced than the single-post lift but is very popular among axle contact lifts. Requires slightly higher maintenance costs, however.

Allows tilting of the vehicle when necessary, permitting good accessibility for underbody work.

9.26 VENTILATION

A carbon monoxide ventilation system should be installed under the floor with an exhaust fan located in the truss space. Exhaust outlets should be provided for each service stall.

In existing buildings, an overhead exhaust system may be perferable because it saves the cost of cutting into concrete floors. Costs for both systems should be carefully evaluated.

9.27 WATER

A main water pipe with feeder lines to each pair of stalls will prevent time-wasting trips across the shop when students need water. A hot water heater, with an adequate recovery rate, should be provided for rest room and wash rack needs. The number of students and expected wash rack volume will determine the capacity of the heater required. Provisions for drinking fountains should be made in the service area.

9.28 STORAGE AREAS

Consider local building and fire codes, as well as insurance regulations, when planning storage areas, especially those for flammable materials. The location of these materials should be convenient for use, but still provide adequate inventory control. Consideration should be given to providing adequate storage for automotive instructional components.

9.29 STUDENT TOOL STORAGE AREA

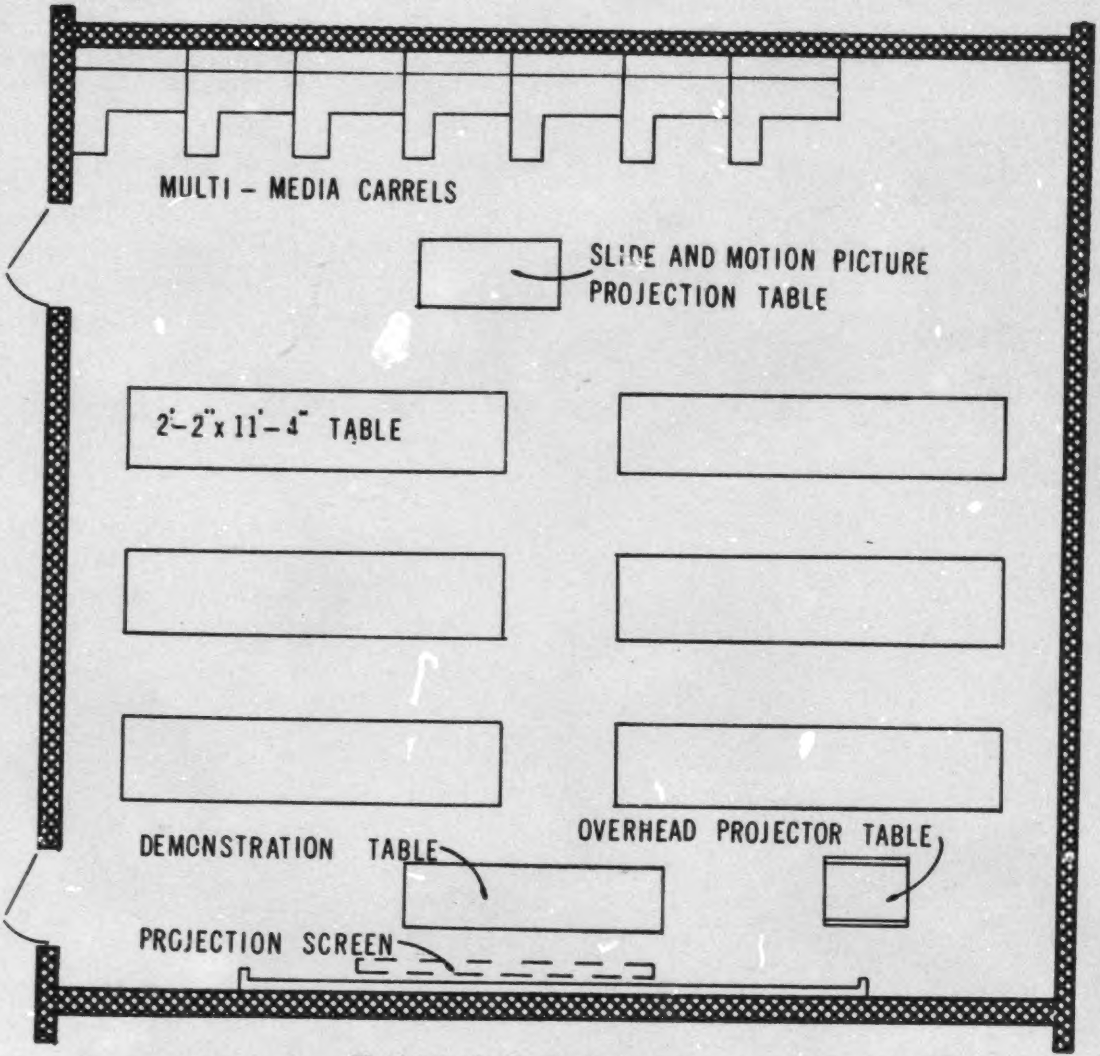
A student tool storage room, or area, should be provided with adequate shelf space for tool boxes and floor space for rollaways. This area should afford maximum security for student tools.

9.30 WRITE-UP AREA

The write-up desk adds a professional touch to the service selling function. It is desirable to have the desks located on the driver's side of the car entering the reception area. Desks should be placed to allow students performing the function of a service salesman to face incoming customers.

9.31 UTILITY ROOM

A utility room should be provided for the placement of large, fixed equipment such as air compressors, hot water plants, and steam plants. A utility room helps minimize fumes and noises which otherwise


MULTI - MEDIA CARRELS
SLIDE AND MOTION PICTURE PROJECTION TABLE
2'-2" x 11'-4" TABLE
DEMONSTRATION TABLE
OVERHEAD PROJECTOR TABLE
PROJECTION SCREEN

The Automotive Service Classroom.

might be objectionable. Proper ventilation must be provided for this equipment. Be sure a competent mechanical contractor is consulted for ventilation specifications.

9.32 SAFETY

Special attention must be given to the construction of automotive service-facilities which provide safe working conditions for students. Cluttered storage areas, obstructed aisles, and overcrowded laboratories can cause injury to students, resulting in costly loss of instructional time and possible lawsuits.

9.33 FIRE PREVENTION

The automotive curriculum involves everyday use of flammable liquids and materials. Extreme caution should be observed to minimize loss due to fire.

School shop construction must adhere strictly to mandatory city, county, and state fire codes and regulations. Consideration must be given to the number, location, and type of fire extinguishers, fire hose cabinets, sprinkler systems, fire buckets, asbestos blankets, metal covered storage cans for oily rags and waste material, and a separate fireproof storage room for flammable solvents, oil, paint, and chemicals.

SECTION 10

TOOLS, SUPPLIES, AND EQUIPMENT

10.1 LOCATION

The tools, supplies, and parts room should be located where it can best serve the various areas of the automotive program. If a body and painting program is also to operate in the same school facility, it may be well to consider a location that will serve both areas.

Consideration must be given to providing adequate storage for the following:

Tools

Adequate storage for tools should be provided. The space needed relates to whether or not "small tools" are provided to the students or if they purchase their own. If small hand tools are purchased by the students, space must be provided for "special" tools such as brake tools, portable electric tools, and automatic transmission tools.

For a Level I program it may be desirable to provide strategically located tool panels in the laboratory area, rather than a tool crib.

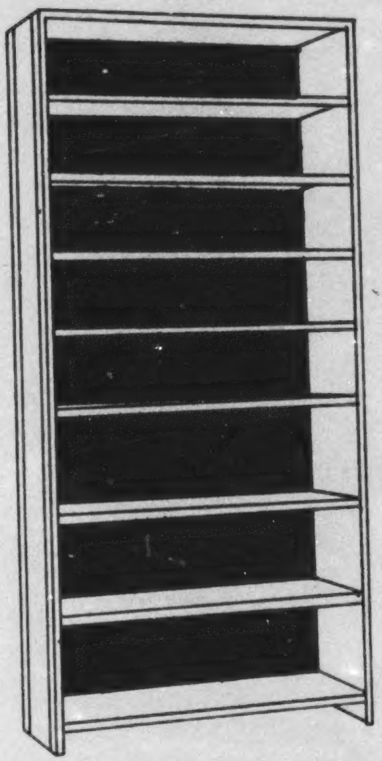
Supplies

A quantity of supply items will need to be stored in this area—brake fluid, oil, electrical wire, bolts and nuts, washers, electrical connectors, wire, waste ranges, etc.

Parts

It is advisable to provide storage space for "fast moving" parts such as points, condensers, plugs, filters, and gaskets.

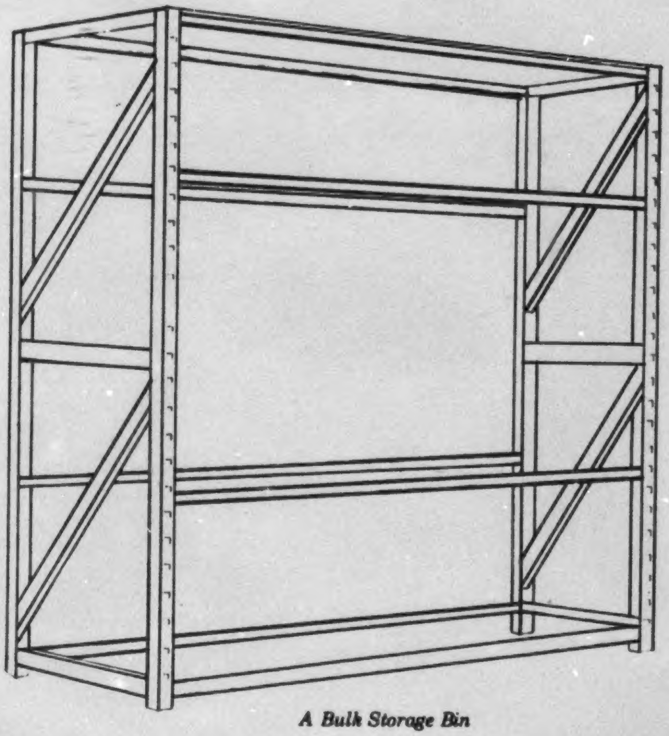
The "tool crib" and parts department should be organized in much the same way as the parts department in a franchised dealership and present the appearance of a "parts department"—see detailed drawing for layout. It should have a large open counter adjacent to or near the students' work area.



A Heavy Duty Parts Bin

10.2 BIN EQUIPMENT SPACE

Space requirements for bin equipment will relate to the inventory of parts to be stored. The inventory may be kept to a minimum in some areas where jobbers deliver parts on short notice. On the other hand "fast moving" parts should be on hand, as described above.



A Bulk Storage Bin

A description of some of the available storage racks follows:

Regular Parts Bins

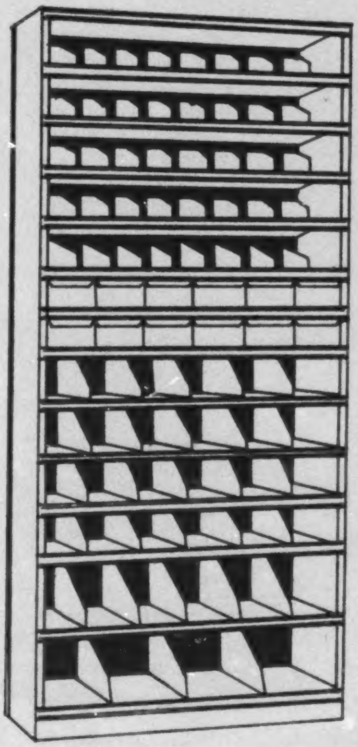
Regular parts bins with sloping dividers provide maximum flexibility to accommodate changes in parts storage needs. They can be ordered with pre-selected shelving and dividers, or they can be customized with available components and accessories to meet specific requirements.

Bulk Storage Bins

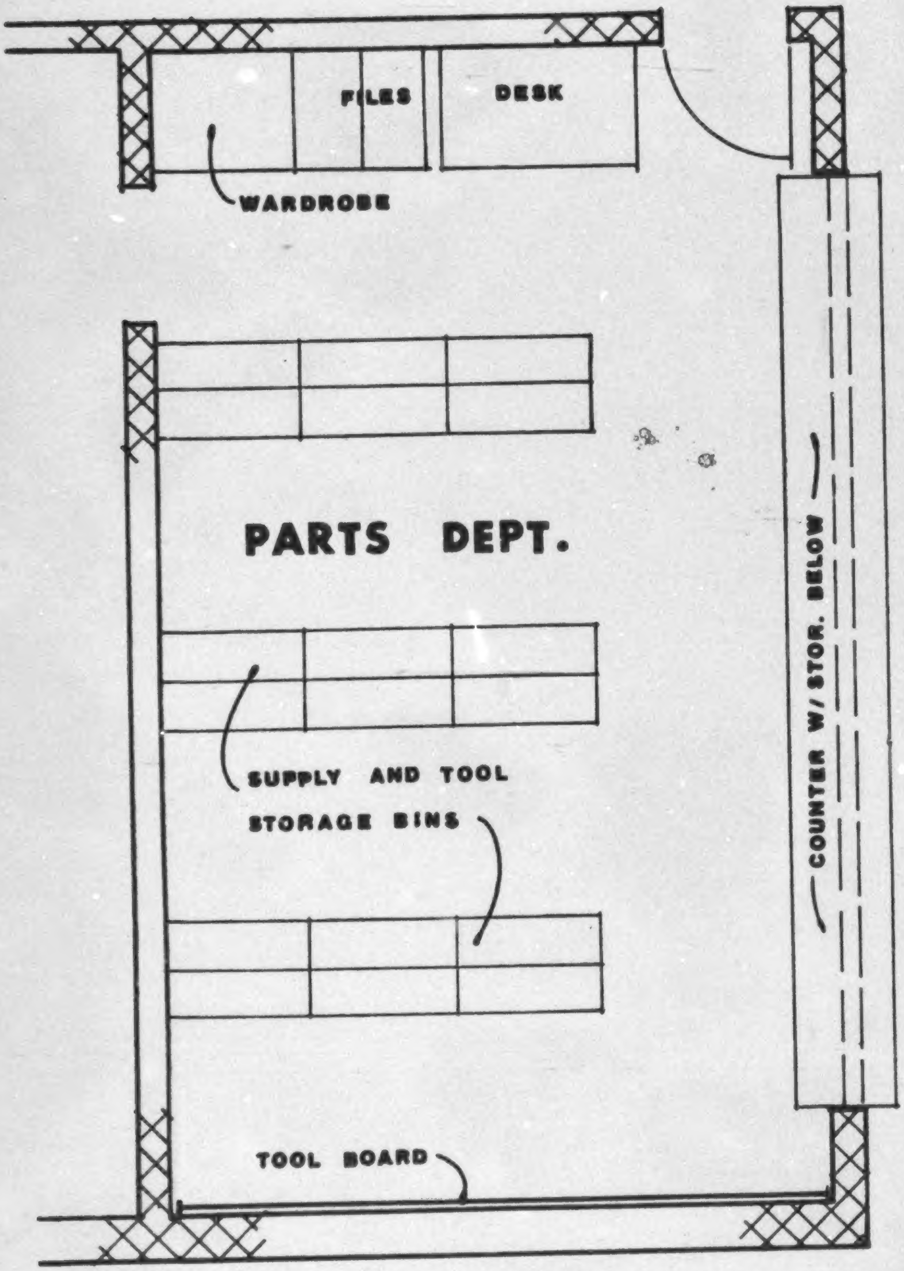
Standard bulk storage bins in open, closed, or bin style, are adjustable to fit a variety of storage needs. Many components are available for customizing standard bin units.

Heavy Duty Stock Racks

Heavy duty stock racks are strong and adjust readily to a variety of uses. Units that can be quickly modified without the use of tools and bolts should be selected. Storage racks of this type can also be used for heavy instructional components, automotic transmissions, etc.



A Regular Parts Bin


FILES
DESK
WARDROBE
PARTS DEPT.
SUPPLY AND TOOL
STORAGE BINS
COUNTER W/ STOR. BELOW
TOOL BOARD

A Sample Parts Department Floor Plan

10.3 SUGGESTED AUTOMOTIVE SERVICE TOOLS

Description	*Standard Quantity*	*Standard Unit*
Adapter, 3/8" female, 1/2" male (for interchanging 3/8 and 1/2" sq. drive sockets and handles)	1	Each
Adapter, 1/2" female, 3/8" male (for interchanging 1/2 and 3/8" sq. drive sockets and handles)	1	Each
Bar, garage, gear type, 1/2" octagon, 16" long	1	Each
Bar, pry, Pitman arm, length 20", fork opening 1-1/4"	1	Each
Caliper, inside, solid nut, 6"	1	Each
Caliper, outside, solid nut, 6"	1	Each
Can, oil, copperized oiler, 1/3 pt.	6	Each
Can, oil, trigger pressure, 6 oz.	6	Each
Can, oily waste, self-closing, 20 gal.	2	Each
Can, safety, 1 gal., (for dispensing flammable liquids)	1	Each
Chisel, cape, 1/4"	1	Each
Chisel, cold, 1/2" stock, 5/8" bit	2	Each
Chisel, cold, 3/4" stock, 7/8" bit	2	Each
Chisel, diamond point, 1/4"	1	Each
Clamp, brake cylinder, hydraulic, slide type (4 to set)	1	Set
Clamp, spring, 2" opening	4	Each
Clamp Arm, for drill press, camlocking lever to lock clamp and part, adjustable for 3 different lengths, removable swivel foot, with installation instructions	1	Each
Cleaner, piston ring groove, equipped with 3/32", 1/8", 3/16" and 5/64" blades	1	Each
Cleaner, tip, for welding torch, size 000 to 4 (drill sizes 75 to 49) (12 to set)	1	Set
Cleaner, tip, for welding torch, size 5 to 7 (drill size 48 to 30) (9 to set)	1	Set
Compressor, piston ring, with ratchet control	2	Each
Compressor, valve spring, universal type, cadmium plated, max. throat opening 10 x 10-1/4", adjustable jaws and plunger bar for flat and cup-shaped valve heads, complete with #32 offset and #35 straight jaws	1	Each
Cooling Pressure Tester	1	Each
Copper, soldering, electric, 28 oz., 200 watts, 120 volts, 5/8" tip	1	Each
Cord, extension, 3-wire, 25', with multi-outlets, parallel blade grounding-type plug (for portable equipment operating on 110-125 volts, combined load 10 amps. max.)	4	Each
Creeper, auto, wood body, padded head rest, mounted on 4 steel cup rollers	4	Each
Cutter, bolt, clipper cut, 30" long	1	Each
Cutter, tubing, capacity 1/8 to 1" O.D. tubing, 4-1/2" overall	1	Each

Description	Standard Quantity	Standard Unit
Die, rethreader kit, consisting of chasers 1/4" x 20 thread, 5/16" x 18 thread, 3/8" x 16 thread, 7/16" x 14 thread, 1/2" x 13 thread, 9/16" x 12 thread, 5/8" x 11 thread	1	Each
Die, rethreader kit, consisting of chasers 1/4" x 28 thread, 5/16" x 24 thread, 3/8" x 24 thread, 7/16" x 20 thread, 1/2" x 20 thread, 9/16" x 18 thread, 5/8" x 18 thread	1	Each
Dies, 1 set taps and dies 1/4" to 1/2" N. F. and N. C.	1	Each
Divider, solid nut, 6"	2	Each
Dresser, emery wheel, length 11-1/2"	1	Each
Drills, 1 set high speed jobber drills 1/16" to 1/2" by 1/64" with stands	1	Set
Drills, 1 each high speed drill D, F, I, Q, R, U, 54, 58, 60	1	Each
Expander, piston ring	1	Set
Extension, for 3/8" square drive	1	Each
Extension, for 3/8" square drive with pin handle hole	1	Each
Extension, for 3/8" square drive, 6"	1	Each
Extension, for 1/2" square drive impact wrench, 2"	1	Each
Extension, for 1/2" square drive impact wrench, 5"	1	Each
Extension, for 1/2" square drive impact wrench, 10"	1	Each
Extractors, screw, set of 5, size of small end 1/8 to 11/32"	1	Set
Figures, steel, 0 to 9 inclusive, 3/16"	1	Set
Frame, hack saw, adjustable, metal handle	4	Each
Gauge, air, tire	2	Each
Gauge, brake shoe adjusting	1	Each
Gauge, drill and tap, for gauging drills #1 to 60 inclusive	1	Each
Gauges, ignition, set of 10, 3/16" wide x 1-1/2" long (thickness .013", .015", .017", .018", .020", .025", .030", .032", .035", and .040") with holder	2	Set
Gauge, screw pitch, 4 to 42	1	Each
Gauges, spark plug gaps, 8 steel wire gauges .015 to .040", taper gauge .015 to .040", electrode bender, double cut file, all retract into plastic case	2	Set
Gauges, step-cut feeler, set of eight (Nos. 4/6, 5/7, 6/8, 7/9, 8/10, 9/11, 10/12, 11/13) with holder	2	Set
Gauges, step-cut feeler, set of eight stepped end blades (8/10, 11/13, 14/16, 15/17, 17/19, 18/20, 20/22, 25/27 thousands) with ring and offset holder	2	Set
Gauge, telescoping, automatic self centering handle, 3-1/2 to 6", extra long handle	1	Each
Gauge, thickness, leaves 3-1/16 x 1/2"	2	Set

Description	*Standard Quantity*	*Standard Unit*
Gauge, tire, inflator type, for use with compressed air	1	Each
Gun, blow, with hook, for use with compressed air	1	Each
Gun, grease, 16 oz. capacity, high pressure (10,000 lb. max.), lever type, length overall approx. 22-1/4"	1	Each
Gun, soldering, electric, dual heat 100 and 140 watts, with 3 soldering tips	4	Each
Hammer, 1-1/2 x 4-3/8" head, replaceable plastic and nylon faces	2	Each
Hammer, ball peen, 8 oz.	2	Each
Hammer, ball peen, 16 oz.	4	Each
Hammer, blacksmith's hand, 40 oz.	1	Each
Hammer, brass head, 1-3/4 lb.	2	Each
Hammer, tire, one steel and one rubber head, weight 2.6 lb.	1	Each
Hammer Face, nylon, 1-1/2 x 1"	1	Each
Hammer, Face, plastic, 1-1/2 x 1"	1	Each
Handle, file, screw type, for files 4 to 6"	1	Doz.
Handle, file, screw type, for files 8 to 10"	1	Doz.
Handle, file, screw type, for files 12 to 14"	1	Doz.
Handle, wrench, hinge, for 1/2" square drive sockets, 18-1/2"	2	Each
Handle, wrench, hinge, for 3/8" square drive sockets, 12"	1	Each
Handle, wrench, for 3/8" square drive sockets, speeder, 17-5/8"	2	Each
Handle, wrench, for 1/2" square drive sockets, nut spinner, 18"	2	Each
Hone, brake cylinder, range 3/4 — 2-1/4", self centering, with 3 extra 280 grit stones	1	Set
Hone, cylinder surfacing, 2" to 7", flexible drive	1	Each
Hydrometer, battery	3	Each
Ignition Point Distributor Aligning Tool	1	Each
Jack, automobile, portable, hydraulic, capacity 3 tons	1	Each
Knife, putty, flexible blade, 1-1/2" wide	3	Each
Letters, steel, 3/16", 28 to set	1	Set
Lift, for engine, 36" steel cable with universal hook adapter	1	Each
Lifter, valve, "stub" type, for late model vehicles	1	Each
Lighter, gas, length 8"	2	Each
Magnifier, reading lens, 2. OX, 10" focal length, 4" diam.	1	Each
Oilstone, 4 x 1 x 1/2", carborundum, machinist's special, fine grit	1	Each
Oilstone, 8 x 2 x 1", carborundum, combination, one side coarse, one side fine grit	1	Each
Pliers, all-purpose, 10", 5 grooved jaw openings	2	Each
Pliers, battery, 8" angle nose, plastic handles	1	Each

Description	*Standard Quantity*	*Standard Unit*
Pliers, battery terminal spreader, reamer, and cleaner	1	Each
Pliers, Bendix brake, length 11-1/4"	2	Each
Pliers, combination, 6"	6	Each
Pliers, for Corbin hose clamp, 8", plastic handle	1	Each
Pliers, diagonal, 7", heavy duty	3	Each
Pliers, ignition, 5"	2	Each
Pliers, lock ring, parallel jaws	1	Each
Pliers, long nose, 6"	2	Each
Pliers, retaining ring, universal	1	Each
Pliers, vise grip, 7"	2	Each
Pliers, vise grip, 10"	2	Each
Pliers, wheel weight, 12"	1	Each
Plug, pipe, black steel, 1/8"	12	Each
Plug, pipe, black steel, 1/4"	12	Each
Protector, terminal, universal (for spark plugs)	6	Each
Puller, battery terminal	1	Each
Puller, gear, medium duty, set consisting of 1 screw, 1 crossarm, 2 sets jaws, 2 live centers, complete in metal box	1	Each
Puller, wheel, universal, in metal box	1	Each
Punch, arch hollow, 5/16"	1	Each
Punch, arch hollow, 3/8"	1	Each
Punch, arch hollow, 1/2"	1	Each
Punch, center, 4" long	6	Each
Punch, drive pin, straight, 1/8"	6	Each
Punch, drive pin, straight, 1/4"	1	Each
Punch, drive pin, straight, 5/16"	1	Each

Description	*Standard Quantity*	*Standard Unit*
Punch, drive pin, straight, 3/8"	1	Each
Punch, long taper, 5/16 x 10 x 1/8" point	1	Each
Punch, long taper, 3/8 x 10 x 3/16" point	1	Each
Punch, long taper, 1/2 x 10 x 1/4" point	1	Each
Punch, long taper, 5/8 x 10 x 5/16" point	1	Each
Punch, pin, 1/4"	2	Each
Punch, pin, 5/16"	2	Each
Punch, pin, 3/8"	2	Each
Ratchet, reversible, 1/4" sq. drive	1	Each
Ratchet, reversible, 3/8" sq. drive	4	Each
Ratchet, reversible, 1/2" sq. drive	2	Each
Rethreading Tool, 5/8 to 1-1/4" for restoring battered axle threads	1	Each
Screwdriver, 1" blade, plastic handle, stubby	2	Each
Screwdriver, 4" blade, plastic handle	6	Each
Screwdriver, 6" blade, plastic handle	6	Each
Screwdriver, 8" blade, plastic handle	4	Each
Screwdriver, 12" blade, plastic handle	1	Each
Screwdriver, clutch head or butterfly, plastic handle, 5/32"	1	Each
Screwdriver, clutch head or butterfly, plastic handle, 3/16"	1	Each
Screwdriver, clutch head or butterfly, plastic handle, 1/4"	1	Each
Screwdriver, clutch head or butterfly, plastic handle, 5/16"	1	Each
Screwdriver, clutch head or butterfly, plastic handle, 3/8"	1	Each
Screwdriver, offset, 1/4 x 4-5/8"	2	Each

Description	*Standard Quantity*	*Standard Unit*
Screwdriver, offset, Phillips, #1 and #2	1	Each
Screwdriver, Phillips, plastic handle, size #1 (for Phillips recessed head screws #4 and smaller)	1	Each
Screwdriver, Phillips, plastic handle, size #2 (for Phillips recessed head screws #5 to #9)	1	Each
Screwdriver, Phillips, plastic handle, size #3 (for Phillips recessed head screws #10 to #16)	1	Each
Screwdriver, Phillips, plastic handle, stubby, #1	1	Each
Screwdriver, screw holding, split type for slot head screws, sizes #8 to #12	1	Each
Snips, aircraft, 10" long, for left hand	1	Each
Snips, aircraft, 10" long, for right hand	1	Each
Spoon, brake adjusting, 1-3/16" and 1-7/16" spoons, overall length 7"	4	Each
Spoon, brake adjusting, 1-3/4" spoons, overall length 9-1/16"	1	Each
Square, steel, combination set, 12" blade, complete with bevel protractor and center head	1	Each
Stethoscope, mechanics, with 6" and 12" probe	1	Each
Tap and die set, machine screw size	1	Each
Tester, battery cell probe, for testing individual cells on hard top batteries	1	Each
Tool, cleaning, for battery posts and terminals, twist-type, plastic case and cap	1	Each
Tool, tire valve stem and valve core installation, approx. 10" flexible cable	1	Each
Tray, tote, plastic, 6 x 10", depth 4", for storage of small parts, for use with built-in wall cabinet	70	Each
Universal Joint, 3/8" square drive	1	Each
Universal Joint, 1/2" square drive	1	Each
Valve Key Replacer Tool	1	Each
Wrenches, for Allen hex-head screws, .050, 1/16, 5/64, 3/32, 1/8, 5/32, 3/16, 7/32, 1/4, 5/16, 3/8", set of 11 in plastic case	1	Set
Wrench, box, for Chrysler brakes, 6-point, 3/8 x 7/16" openings, length approx. 9-1/2"	1	Each
Wrench, box, for distributor, 1/2" opening	1	Each
Wrench, box, for distributor, 9/16" opening	1	Each
Wrench, box, "L" shape brake bleeder, 6-point, 1/4 x 3/8" openings	1	Each
Wrench, box, offset, 6-point, 3/8 x 7/16"	1	Each
Wrench, box, for starters, 12-point, 5/8 x 9/16" openings	1	Each
Wrench, combination box and open end, 5/16", 12-point, 15 degree angle box, short handle	2	Each

Description	Standard Quantity	Standard Unit
Wrench, combination box and open end, 3/8", 12-point, 15 degree angle box, short handle	2	Each
Wrench, combination box and open end, 7/16", 12-point, 15 degree angle box, short handle	4	Each
Wrench, combination box and open end, 1/2", 12 point, 15 degree angle box, short handle	6	Each
Wrench, combination box and open end, 9/16", 12-point, 15 degree angle box, short handle	6	Each
Wrench, combination box and open end, 5/8", 12-point, 15 degree angle box, short handle	2	Each
Wrench, combination box and open end, 11/16", 12-point, 15 degree angle box, short handle	2	Each
Wrench, combination box and open end, 3/4", 12-point, 15 degree angle box, short handle	2	Each
Wrench, combination box and open end, 13/16", 12-point, 15 degree angle box, long handle	1	Each
Wrench, combination box and open end, 7/8", 12-point, 15 degree angle box, long handle	1	Each
Wrench, combination box and open end, 15/16", 12-point, 15 degree angle box, long handle	1	Each
Wrench, combination box and open end, 1", 12-point, 15 degree angle box, long handle	1	Each
Wrench, flare nut, double end, 3/8 x 7/16" openings	2	Each
Wrench, flare nut, double end, 1/2 x 9/16" openings	2	Each
Wrench, flare nut, double end, 5/8 x 3/4" openings	2	Each
Wrench, oil filter, disposable-type, self-locking, self-adjusting	2	Each
Wrench, open ends, 15 degree angle, 3/8 x 7/16" openings	6	Each
Wrench, open ends, 15 degree angle, 1/2 x 9/16" openings	6	Each
Wrench, open ends, 15 degree angle, 5/8 x 11/16" openings	4	Each
Wrench, open ends, midget, 15 degree and 60 degree angle heads, 15/64 x 13/64" openings	2	Each
Wrench, open ends, midget, 15 degree and 60 degree angle heads, 1/4 x 7/32" openings	2	Each
Wrench, open ends, midget, 15 degree and 60 degree angle heads, 5/16 x 9/32" openings	2	Each
Wrench, open ends, midget, 15 degree and 60 degree angle heads, 11/32 x 3/8" openings	2	Each
Wrench, pipe, straight pattern, 10"	1	Each
Wrench, pipe, straight pattern, 14"	1	Each

Description	*Standard Quantity*	*Standard Unit*
Wrench, rim, 4-way, for wheel lug nuts, extra deep hex. openings of 13/16, 3/4, 7/8 and 15/16", not less than 10" arms	2	Each
Wrench, single end, adjustable, 4"	2	Each
Wrench, single end, adjustable, 6"	4	Each
Wrench, single end, adjustable, 8"	4	Each
Wrench, single end, adjustable, 10"	2	Each
Wrench, single end, adjustable, 12"	2	Each
Wrench, single end, adjustable, 15"	2	Each
Wrench, socket, 3/8" square drive, 3/8 x 1/16" screwdriver bit	1	Each
Wrench, socket, 6 point, 3/8" square drive, 7/16" opening	4	Each
Wrench, socket, 6 point, 3/8" square drive, 1/2" opening	4	Each
Wrench, socket, 6 point, 3/8" square drive, 9/16" opening	4	Each
Wrench, socket, 6 point, 3/8" square drive, 5/8" opening	4	Each
Wrench, socket, 6 point, 3/8" square drive, 11/16" opening	4	Each
Wrench, socket, 6 point, 3/8" square drive, 3/4" opening	4	Each
Wrench, socket, 6 point, 1/2" square drive, 1/2" opening	4	Each
Wrench, socket, 6 point, 1/2" square drive, 9/16" opening	4	Each
Wrench, socket, 6 point, 1/2" square drive, 5/8" opening	4	Each
Wrench, socket, 6 point, 1/2" square drive, 11/16" opening	4	Each
Wrench, socket, 6 point, 1/2" square drive, 3/4" opening	4	Each
Wrench, socket, 6 point, 1/2" square drive, 13/16" opening	2	Each
Wrench, socket, 6 point, 1/2" square drive, 7/8" opening	2	Each
Wrench, socket, 6 point, 1/2" square drive, 1" opening	2	Each
Wrench, socket, 6 point, 1/2" square drive, 1-1/16" opening	1	Each
Wrench, socket, 6 point, 1/2" square drive, 1-1/8" opening	1	Each
Wrench, socket, 6 point, 1/2" square drive, 1-3/16" opening	1	Each
Wrench, socket, 6 point, 1/2" square drive, 1-1/4" opening	1	Each
Wrench, socket, 12 point, 1/2" square drive, 1-5/16" opening	1	Each
Wrench, socket, deep, 6 point, 3/8" square drive, 3/8" opening	2	Each
Wrench, socket, deep, 6 point, 3/8" square drive, 7/16" opening	2	Each
Wrench, socket, deep, 6 point, 3/8" square drive, 1/2" opening	2	Each
Wrench, socket, deep, 6 point, 3/8" square drive, 9/16" opening	2	Each
Wrench, socket, deep, 6 point, 3/8" square drive, 5/8" opening	2	Each
Wrench, socket, deep, 6 point, 3/8" square drive, 11/16" opening	2	Each
Wrench, socket, deep, 6 point, 3/8" square drive, 3/4" opening	2	Each

Description	*Standard Quantity*	*Standard Unit*
Wrench, socket, deep, 6 point, 3/8" square drive, 13/16" opening, with 3/4" hex. head and rubber insert for spark plugs	4	Each
Wrench, socket, deep, 6 point, 3/8" square drive, 7/8" opening	2	Each
Wrench, socket, deep, 12 point, 1/2" square drive, 1" opening	1	Each
Wrench, tap, capacity 1/16" to 1/4" taps, sliding tee handle	2	Each
Wrench, universal, socket, 12 point, 3/8" square drive, 7/16" opening	1	Each
Wrench, universal, socket, 12 point, 3/8" square drive, 1/2" opening	2	Each
Wrench, universal, socket, 12 point, 3/8" square drive, 9/16" opening	2	Each
Wrench, universal, socket, 12 point, 3/8" square drive, 5/8" opening	1	Each
Wrench, universal, socket, 12 point, 3/8" square drive, 11/16" opening	1	Each
Wrench, universal, socket, 12 point, 3/8" square drive, 3/4" opening	1	Each
Extension, for 1/4" square drive, 2"	1	Each
Extension, for 3/8" square drive, 12"	3	Each
Wrenches, for Allen hex. head screws, set of 9 wrenches, 2, 2-1/2, 3, 4, 5, 6, 8, 10, and 12 mm.	1	Set
Wrench, box, for distributor, 1/2" opening	1	Each
Wrench, combination box and open end, 5/8", 12 point, 15 degree angle box, long handle	1	Each
Wrench, combination box and open end, 11/16", 12 point, 15 degree angle box, long handle	1	Each
Wrench, combination box and open end, 3/4", 12 point, 15 degree angle box, long handle	1	Each
Wrench, socket, 6 point, 3/8" square drive, 3/8" opening	1	Each
Wrench, socket, 6 point, 1/2" square drive, 15/16" opening	1	Each
Wrench, impact air, reversible, 0 to 150 ft. lb. torque, 1/2" sq. drive, capacity-bolts to 1/2" diam., complete with 6 hex. sockets one each: 1/2, 9/16, 5/8, 11/16, 3/4 and 13/16"; instructions, and metal carrying case	2	Each
Wrench, torque, capacity 0 to 150 in. lb., with 2-1/2 in. lb. graduations, 3/8" square drive, reversible dial	1	Each
Wrench, torque, capacity 10 to 150 ft. lb. with 1 ft. lb. graduations, 1/2" sq. drive, reversible built-in ratchet head	2	Each

Description	Standard Quantity	Standard Unit
Wrench Set, 3/8" square drive, consisting of ratchet, speeder, nut spinner, sliding bar, universal, and one each 3", 6" and 12" extensions, eleven 6 point hex. sockets, one each 1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 11/16, 3/4, 13/16 and 7/8", full chrome finish, complete set enameled metal box	5	Set
Wrench Set, metric, consisting of seventeen 3/8" square drive sockets, 6 point hex., sizes 6-22 mm. inclusive and nine short series combination box and open end wrenches, sizes 10-18 mm. inclusive, in kit bag, with socket holders, in metal box approx. 2-1/2 x 5 x 14"	1	Set
Wrench Set, midget, 1/4" square drive, consisting of reversible ratchet, spinner with plastic handle, sliding bar handle, one each: 7/32, 1/4, 9/32, 5/16, 11/32, 3/8 and 7/16" 6-point sockets, one each: 1/4 and 5/16" 8-point sockets, chromium plated, complete in metal box	2	Set

10.4 SUGGESTED AUTOMOTIVE SERVICE SUPPLIES

Description	Standard Quantity	Standard Unit
Abrasive Compound, for glass bead type spark plug cleaner	1	Can
Abrasive Compound, for spark plug cleaner	1	Pkg.
Alcohol, denatured (1 gal. can)	1	Gal.
Battery, flashlight, 1 cell, 2-27/64 x 1-21/64"	6	Each
Battery, storage, 6 volt, 90 amp. hr.	1	Each
Battery, storage, 12 volt, 50 amp. hr.	1	Each
Blade, hack saw, 10", 18 teeth, flexible back, high speed-molybdenum steel (10 to pkg.)	1	Pkg.
Blade, hack saw, 10", 24 teeth, flexible back, high speed-molybdenum steel (10 to pkg.)	1	Pkg.
Bolt, battery terminal, with nut lead coated, 5/16" S.H., 1-1/4" long (50 to pkg.)	1	Pkg.
Bottle, with dispensing cap, plastic, 8 oz., for use with polyvinyl glue	1	Each
Brake fluid (gal.)	1	Can
Brush, counter, duster, 8"	6	Each
Brush, rotary, for cleaning carbon (used with 1/4" drill)	1	Each
Brush, cleaning solvent	1	Doz.
Brush, wire, cleaning, 6 x 1"	1	Doz.
Brush, wire wheel, 32 ga., for 1/2" arbor, 6" diam. x 1" face	1	Each
Cable, battery charging, acid proof, extra flexible, 10 ga. (100 ft. to spool)	1	Spl.

Description	Standard Quantity	Standard Unit
Cable, ignition, high tension, synthetic covered, black, 7 mm., 16 ga., 19 x 29 stranding (100 ft. to spool)	1	Spl.
Cable, low tension, plastic covered, black, 16 ga., 19 x 29 stranding (100 ft. to spool)	1	Spl.
Cable, low tension, plastic covered, blue, 14 ga., 19 x 27 stranding (100 ft. to spool)	1	Spl.
Cable, low tension, plastic covered, red, 10 ga., 19 x 23 stranding (100 ft. to spool)	1	Spl.
Cement, gasket, all-purpose, liquid (4 oz.)	1	Can
Cement, gasket, hardening, (11 oz.)	1	Tube
Cement, gasket, non-hardening (11 oz.)	1	Tube
Cement, weatherstrip, light colored, fast drying, (5 oz.)	1	Tube
Cleaner, cold type, liquid, water seal for carburetors and small parts, to consist of: 4 gal. of cleaner, parts basket with handles, 5 gal. container with lid	1	Kit
Cleaner, concrete garage floor, water soluble powder, oil and grease removing (5 lbs.)	10	Pkg.
Cleaner, hand, dispenser, cream type, double action	1	Can
Cleaner, for automotive parts (25 lb. can)	1	Can
Clips, battery (10 to pkg.)	1	Pkg.
Clips, distributor, plated, 7 mm. (100 to box)	1	Box
Clips, test, alligator type, not insulated, 2" (10 to pkg.)	1	Pkg.
Cloth, metal cutting, 1-1/2", #80 grit (50 yd.)	1	Roll
Cloth, metal cutting, 1-1/2", #150 grit (50 yd.)	1	Roll
Cloth, metal cutting, 9 x 11", #100 grit (replaces emery cloth)	12	Sht.
Cloth, metal cutting, 9 x 11", coarse, #60 grit (replaces emery cloth)	12	Sht.
Compound, grinding, valve, water, fine	1	Lb.
Connector, battery (10 to pkg.)	1	Pkg.
Cotter Pins, 1/16 x 3/4" (1000 to box)	1	Box
Cotter Pins, 3/32 x 1" (1000 to Box)	1	Box
Cotter Pins, 1/8 x 2" (500 to box)	1	Box
Cotter Pins, 5/32 x 2" (500 to box)	1	Box
Coupling, automatic, for compressed air hose, 1/4" male thread, coupler valve body	1	Each
Coupling, automatic, for compressed air hose, 1/4" male thread, coupler valve body, insert plug	2	Pair
Coupling, automatic, for compressed air hose, 1/4" male thread, insert plug	3	Each
Cover, fender, 22 x 47", with 3 section tool pockets, grease proof top	2	Each

Description	*Standard Quantity*	*Standard Unit*
Eye Protective Devices:		
Face Shield, with adjustable headgear, pin and hole type, clear replaceable window 8 x 11-1/8 x .040", 3-snap attachment	*4*	*Each*
Face Shield, gas welder's adjustable headgear, pin and hole type, removable fiber visor, 3-snap attachment, with 2 x 4-1/4" lens	*2*	*Each*
Goggles, splashproof, full width vinyl cup, removable clear plastic lens, hooded and screened ventilators, with headstrap	*2*	*Each*
Headstrap, neoprene, replacement for splashproof goggles	*6*	*Each*
Lens, colored glass, green #5, 2 x 4-1/4", for gas welder's face shield	*4*	*Each*
Spectacles, safety, clear tempered glass lenses, plastic frame with multi-fit bridge, combination metal plastic spatula-type temples, universal size, clear plastic side shields	*For Each Student*	*Each*
Visor-Goggles, clear one-piece acrylic plastic lens, .075" thick, soft opaque vinyl visor with screened bonnet-type ventilators and adjustable neoprene headstrap	*6*	*Each*
Window, 8 x 11-1/8 x .040", clear plastic, metal edge bound, 3-snap attaching	*2*	*Each*
File, flat, bastard, 8"	2	Each

Description	*Standard Quantity*	*Standard Unit*
File, flexible (for voltage regulators)	2	Each
File, half round, bastard, 10", D cut	1	Each
File, half round, smooth, 10"	1	Each
File, ignition point, 5", tungsten, chisel tip	2	Each
File, mill, bastard, 8"	6	Each
File, mill, bastard, 10"	4	Each
File, mill, bastard, 12"	2	Each
File, mill, 2nd cut, 6"	1	Each
File, round, bastard, 6"	1	Each
File, round, bastard, 10"	1	Each
File, round, 2nd cut, 8"	1	Each
File, slim taper, 6"	1	Each
File, square, bastard, 8"	1	Each
File, vixen, flat, curved tooth, 10", with tang	1	Each
File, vixen, flat, curved tooth, standard cut, 14", without tang	1	Each
File Card (for cleaning files)	4	Each
Filler, for automatic transmissions	1	Each
Filler, battery or radiator, 6 oz.	2	Each
Fittings, one standard garage assortment of compression and flared fittings	1	Each
Flaring Tool, double, for tubing	2	Each
Flint, for gas lighter	1	Box
Flux, brazing, for copper, bronze, and steel	2	Lb.
Fuses, one standard garage assortment of automotive fuses	1	Each
Gasket Paper, Vellumoid, 1/64" thick by 36" wide, #3	1	Yd.
Gasket Paper, Vellumoid, 1/32" thick by 36" wide, #5	1	Yd.
Gasket Paper, Vellumoid, 1/16" thick by 36" wide, #6	1	Yd.

Description	Standard Quantity	Standard Unit
Glue, white, polyvinyl resin acetate, semi-liquid, water resistant, 8 oz. plastic bottle	1	Btl.
Grease, multi-purpose, #2 density (lb.)	2	Can
Hose, compressed air, 1/4'' I. D., red neoprene covered (25" to length)	1	Lgth.
Lamp, Mazda, rough service	1	Pkg.
Lamp, for Weller soldering gun, (10 to pkg.)	1	Pkg.
Lubricant, white, water repellent, #3 density	1	Can
Nuts, one garage assortment NF, NC, 1/4" to 1/2"	1	Each
Nuts, one brass nut assortment #4 to #10	1	Each
Oil, lubricating, medium motor, S. A. E. 30 (1 gal. can)	2	Gal.
Oil, penetrating (pint)	1	Can
Oil, thread cutting, black, sulphur base (1 gal.)	1	Can
Petrolatum, white (lb.)	1	Can
Plastigage, .001 to .003'', for fitting bearings (12 sticks to box)	1	Box
Repair Kit, for tubeless tires, with rubber plugs, 4 oz. cement and plug inserting needle	1	Each
Rod, welding, manganese bronze, 1/8 x 36" (approx. 7 to lb.)	3	Lb.
Rod, welding, manganese bronze, 3/16 x 36" (approx. 3 to lb.)	3	Lb.
Rod, welding, mild steel, copper coated, 1/16 x 36" (10 lbs. to pkg.)	1	Pkg.
Rod, welding, mild steel, copper coated, 3/32 x 36" (10 lbs. to pkg.)	1	Pkg.
Rod, welding, mild steel, copper coated, 1/8 x 36" (10 lb. to pkg.)	1	Pkg.
Sandpaper, flint, extra-fine grit, 1" wide x 50 yd. roll (for commutators)	1	Roll
Sandpaper, wet or dry, #280 (50 Shts. to pkg.)	2	Pkg.
Scraper, gasket, 1-1/2" blade, length 10-3/8", plastic handle	1	Each
Screws, cap garage assortment 1/4" x 1/2" to 3/8" x 2-1/2" NF and NC	1	Each
Screws, machine, garage assortment, brass R.H. #4-40 to #10-32	1	Each
Screws, sheet metal garage assortment	1	Each
Shim, feathered, aluminum, laminated from .003 to .0015"	1	Pkg
Shim, post, soft lead (25 to pkg.)	1	Pkg.
Soap, pumice (approx. 4 oz.)	10	Cake
Sodium, Bicarbonate, U. S. P. (bulk)	2	Lb.
Solder, wire, 60/40, 1/16" multicore type (lb.)	1	Spl.
Solder, wire, half and half, 1/8" (5 lb. to Spl.)	1	Spl.
Soldering Paste (2 oz.)	1	Can
Solvent, cleaning (5 gal.)	8	Can
Steel Wool, 16 ribbon fold pads, #0 medium (3/4 lb.)	1	Pkg.

Description	Standard Quantity	Standard Unit
Tape, electrical, vinyl, black, 3/4" x 66"	6	Roll
Terminals, one garage assortment electrical connectors	1	Each
Tubing, copper, soft, 20 ga., 1/4" O. D. (.035" wall) (50 ft. to coil)	1	Coil
Tubing, copper, soft, 5/16" diam.	1	Coil
Valve Core, (5 to pkg.)	1	Pkg.
Washers, one garage assortment of flat washers	1	Each
Washers, one garage assortment of lock washers	1	Each
Washers, one garage assortment of brass machine screw sizes	1	Each
Wire, steel, black annealed, 16 ga. (.63") (96 ft.)	1	Lb.
Wire, steel, black annealed, 18 ga. (.048") (50 ft.)	1	Coil

10.5 EQUIPMENT

Description	Standard Quantity	Curriculum Level
Air Conditioner Repair Unit, consisting of pullers, removers, adapters, special feeler gauges, and tools for most late model domestic automobiles in metal box, plus system analyzer, necessary hoses, leak detector, circuit tester, thermometer, ratchet, two refrigerant can dispenser valves, instruction sheet, and 1/4 H. P. 115-volt portable vacuum pump	1	3
Aligner, front wheel, complete set, portable rack or pit type, depending on lab facilities	1	3
Armature Lathe Turner, for dressing commutator, portable, complete with 5 bushing and cutter and undercutting attachment	1	3
Armature Tester (growler), portable 120-volt, complete with test light, A. C. ammeter, high-low-off switch, necessary test leads and instructions	1	3
Balancer, wheel, on-car-type adequate for disc brakes	1	2,3
Battery Starter Tester	1	2,3
Bearing Packer, hand operated, for bearing sizes 3/4" to 3-1/2" O.D., capacity 1 lb. of lubricant	1	1,2,3
Bench, work, 3'6" x 7'0", height 2'10-3/8", 12 gauge steel top, 2-compartment metal base cabinet with 3 shelves and doors to lock	1/stall	1,2,3
Bleeder, pressure, for hydraulic brakes, 1 gallon capacity, complete with air and bleeder hose, and standard adapters	1	2,3
Brake, shop, mobile, complete with disc attachments	1	2,3

Description	Standard Quantity	Curriculum Level
Charger, fast and slow, 6- and 12-volt battery, cart type, capacity not less than 75 amps. at 6 volt and not less than 40 amps. at 12 volt, complete with meter, controls, cord, and battery leads	1	1,2,3
Charger, slow, max. capacity three 12-volt or six 6-volt batteries, portable, with meter, 6 ft. power cord, D. C. cables and 5 jumper cables	1	1,2,3
Cleaner, portable, steam or detergent	1	3
Compression Tester, range 0 to 300 lb. by 5 lb.	1	1,2,3
Crane, hoist, with extension beam, portable, hydraulic, one ton capacity	1	2,3
Dispenser, gear oil	1	1,2,3
Distributor Tester, portable off-the-car unit	1	3
Drain, oil, portable	1	1,2,3
Drill, portable, electric, 1/4 in. capacity	2	1,2,3
Drill, portable, electric, 3/8 in. capacity	1	1,2,3
Drill, portable, electric, 1/2 in. capacity	1	1,2,3
Dwell-Tach Tester	2	2,3
Engine Analyzer with scope	1	2,3
Fuel Pump Tester	1	2,3
Grinder, 6 x 3/4", 3450 RPM, 1/3 H. P., on pedestal base, with illuminated eyeshields, 2 grinding wheels, and 1 wire brush	1	1,2,3
Grinder, 10 x 1-1/4", 1750 RPM, floor type, motor driven, 1 H. P., with 2 grinding wheels, 1 wire brush, eyeshields	1	2,3
Infra-red Emission Tester	1	3
Indicator, dial test, universal, complete with attachments, in fitted case	1	3
Jack, floor, hydraulic, 2-ton capacity	2	1,2,3
Jack, for removing transmission, floor type, with adjustable stand for hoist	1	3
Lubricator, chassis, air operated	1	1,2,3
Micrometer, brake drum, universal type, may be included in brake shop	1	2,3
Micrometer Caliper, outside, range 0 to 1" with spindle lock and ratchet stop	6	1,2,3
Micrometer Caliper, outside, range 0 to 4", with spindle lock and ratchet stop	1	2,3
Press, arbor, bench	1	2,3
Press, hydraulic, 15-ton capacity	1	3
Puller, gear, heavy duty, set consisting of 1 screw, 1 crossarm, 4 sets of jaws, 1 live center, complete in metal box (set)	1	2,3
Puller, slide hammer, complete with 3-1/2", 4-1/2", 7-3/4" jaws, and pilot puller jaws	1	2,3
Puller, steering wheel, universal, in metal box	1	2,3

Description	Standard Quantity	Curriculum Level
Puller Attachments, for removing and installing rear axle bearings on flange-type axles	1	2,3
Reamer, ring ridge, range 3 to 5", self-centering, with tungsten carbide cutter	1	3
Separator-Puller, split wedge type, for bearings and gears, max. opening 4 x 4-1/2"	1	3
Spark Plug Cleaner	1	1,2,3
Stand, car, adjustable 15 to 24"	16	1,2,3
Step Plate Adapters, round, counterbored center section with center hole, fourteen sizes ranging from 1 to 2-7/8" outside diam., for use with gear puller to install oil seals or to provide base for puller screw in hollow shafts	1 Set	3
Tank, cleaning, for auto parts, 20 gal. capacity, mounted on mobile base, complete with self-closing cover, circulating pump, 115-volt motor, soaking tank, drying shelf and parts basket	1	1,2,3
Timing Advance Unit	1	3
Timing Light, 6-12 volt	2	1,2,3
Tire Mounting Machine, complete with attachments	1	1,2,3
Vacuum Tester, gauge	1	2,3
Valve Shop, including refacer and seat grinder	1	2,3
Vise, drill press, horizontal and vertical grooved jaws, 2-1/2" wide x 3" opening	1	1,2,3
Volt-Ampere-Tester	2	2,3
Welding and cutting outfit (two stage) complete with cart	1	1,2,3

The following pages may be detached and used as masters for printing. A filled-in sample of these forms appears on pages 25-27.

(Cut Along Dotted Line)

COOPERATIVE TRAINING PLAN

PROGRAM ______________________________

This training plan is to (1) define clearly the conditions and schedule of training whereby student:

____ is to receive training as a (an)

__________________________________ and (2) serve as a guide to the cooperating parties:

the ______________________________ and the ______________________________

Public Schools, in providing the student with opportunities for training in the basic skills of the occupation and the technical information related to it. In order that a systematic plan which provides for well-rounded training can be followed, a schedule of work experiences and a course of study paralleling it have been worked out and agreed upon by the employer and representative of the school. They are listed on the reverse side of this page.

The student agrees to perform diligently the work experiences assigned by the employer according to the same company policies and regulations as apply to regular employees. The student also agrees to pursue faithfully the prescribed course of study and to take advantage of every opportunity to improve his efficienty, knowledge, and personal traits so that he may enter his chosen occupation as a desirable employee at the termination of the training period.

In addition to providing practical instruction, the employer agrees to pay the student for the useful work done while undergoing training according to the following plan:

1. The beginning wage will be $ __________ per __________ for __________ hours per school week, which amount is approximately __________________ per cent of that paid competent full-time employees in the same occupation in the community.

2. A review of the wages paid the student will be made jointly by the employer and coordinator at least once each semester for the purpose of determining a fair and equitable wage adjustment consistent with the student's increased ability and prevailing economic conditions.

The training period begins the __________ day of ____________________, 19 ___, and extends through ______________________________, 19 ___. There will be a probationary period of __________ days during which the interested parties may determine if the student has made a wise choice of an occupation, and if the training should be continued.

This plan has been reviewed and recommended by the Local Advisory Committee. It may be terminated for just cause by either party.

Approvals:

____
(STUDENT)

____
(NAME OF EMPLOYER)

____
(PARENT OR GUARDIAN)

____
(NAME OF COMPANY)

____
(CHAIRMAN, LOCAL ADVISORY COMMITTEE)

____
(TEACHER-COORDINATOR)

____
(DIRECTOR, VOCATIONAL EDUCATION DIVISION)

COOPERATIVE TRAINING PLAN PROGRESS EVALUATION

Student's Name ______________________________

Work Experiences Provided	Completed	Evaluation

Study Assignments	Record of Study

(Cut Along Dotted Line)

EMPLOYER'S REPORT TO THE SCHOOL

Student's Name ______________________ Occupation ______________________

Employer ______________________ Date ______________________ 19 ______

Period: From ______________________ 19 ______ to ______________________ 19 ______

To the Employer: To better assist you in training the above named student so he or she will become a more valuable employee, we are asking that you fill in the form. Will you please place a check in one of the spaces to the right of each characteristic which best expresses your judgment of the student, and return this report to the coordinator of the program.

Work Record	Fair	Good	Very Good	Excellent
Quality of Work				
Adaptability				
Punctuality				
Dependability				
Appearance				
Attitude Toward Fellow Workers				
Attitude Toward Job				

Individual Comment: ____

____

____

Signature of Employer ____

Will you please write on the lines above some comment about the student whose name appears at the top of this sheet? Also if you have any suggestions as to what the school can do to increase the competencies of the student as an employee, it will be very welcome. We at the school are anxious to cooperate.

Thank you very much,
Coordinator Occupational Training

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